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by Norman Damon*

culture; the Bureau of Mines, Bureau of Standards, and Automotive Division in the Department of Commerce; the State Department, and Interstate Commerce Commission are among the more important administrative agencies with which the industry is familiar. To describe fully the ramifications of the work these departments are doing would require a volume.

The interest of the Federal Government arises not alone from the 4,000,000 persons directly or indirectly employed by the motor industry, but because the operation of 26,000,000 of these vehicles influences the daily economic and social life of the nation.

Specifically, here are some of the more important high spots of activity related to the motor industry.

As a customer the Government does not rank high in volume but A-1 on credit. Prospective business for the fiscal year 1932, which began on July 1 of this year, will amount to at least \$3,500,000, including expenditures for automobiles, ambulances, motor trucks, buses, tractors, trailers, parts and other equipment. More than one-third of the total will be disbursed by the Post Office Department, which has contracted in the

last three months for 2000 light trucks.

The War Department has already expended most of the half million dollars of its 1932 appropriation, which was available on passage of the bill. The purchase of new parts for assembly at Camp Holabird may indicate a departure from the policy of purchase of complete new vehicles. This point is of particular interest in connection with the proposed motorization program involving the expenditure of \$2,000,000 per year for seven years.

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Quarter Billion of Federal Budgets Will Be Spent In Industry and on Roads

FEDERAL purchases of motor vehicle equipment; the building of Federal-aid roads, economic surveys of highway transportation, stimulation of foreign trade, and technical inquiries into fuel consumption, brake performance and wheel impact tests are some of the more important contacts of the automobile industry with the Federal Government through the Washington office of the National Automobile Chamber of Commerce.

The U. S. Bureau of Public Roads and Bureau of Agricultural Economics in the Department of Agri-

The Department of Agriculture, Marine Corps, Coast Guard, Veteran's Bureau, Department of Interior, Navy, and Department of Justice (Prohibition) will be the leading purchasers of equipment this year.

This automotive business of the Government for the fiscal year 1931, totaled \$3,765,000. (This does not include War Department 1932 appropriations expended in the fiscal year 1931.)

A recent survey of Government owned motor vehicles by the National Automobile Chamber of Commerce revealed the U. S. Government as the largest fleet-owner in the world, with more than 27,800 vehicles.

The War Department leads with 11,300 vehicles owned, but only 6351 of these were in operation on Dec. 31, 1930. The Post Office Department, while owning 7520 vehicles, utilizes in the postal service ten times this number through contract, rural carriers, star routes and similar services. Including for the Post Office a total of 77,585 vehicles used in Government service the grand total of Uncle Sam's use exceeds 100,000 units.

Large Road Building Fund

Far in advance of all other activities of interest to the industry is the administration of Federal Highway Aid. At the beginning of this year there was available the annual appropriation of \$125,000,000 and balances from previous appropriations about \$170,000,-000 plus an emergency appropriation of \$80,000,000, or a total of close to \$250,000,000 which could represent the Government's contribution toward road building in the forty-eight states. There was of course \$12,500,000 available in addition to this for forest roads and other funds for roads in the National Parks which the Bureau of Public Roads cooperates in building.

In its Division of Economics, the Bureau of Public Roads also analyzes some of the effects of roads upon the economic life of the country. At present this Bureau in cooperation with the Department of Commerce is studying costs of common carrier truck operation, equipment used, mileage operated and related data. Traffic surveys reveal the present volume and type of traffic over highways making possible forecasts as to necessary mileage, surface types, widths, and qualities. Registration and tax records are maintained which aid in the studies of highway finance.

The Bureau of Agricultural Economics analyzes the effect of roads and motor transport upon the marketing of farm products. A report summarizing findings of several surveys on the transportation of fruits and vegetables by motor truck will be available early in September.

The Bureau of Plant Industry will shortly have ready a report on the suitability of the motor truck in the handling of fruits.

In the Department of Interior the Bureau of Education records the use of the school bus in transporting pupils to more than 16,000 schools.

The Interstate Commerce Commission is now interested in the highway carrier, where he goes, why, and what he carries and what effect his operations have upon the rail system of the country. Examiner Flynn is preparing a report in Docket 23,400 which will be ready for the next session of Congress when it again takes up the subject of interstate bus regulation. Potential competition of the motor truck is an important factor in the Commission's consideration of the present application of the railroads for a horizontal rate increase, as there have been a series of rate reductions permitted by the Commission for purposes of meeting truck competition.

The promotion of foreign trade so far as it may legitimately be aided by Government is largely handled through the Bureau of Foreign and Domestic Commerce, with its Automotive and Tariff Divisions sitting up nights with the sick friend, foreign trade. Contact with domestic affairs is maintained through thirty district and forty-nine cooperative offices.

Through special automotive trade commissioners sixty foreign offices of the Department of Commerce and more than 370 embassies, legations and consulates of the Department of State, the immediate news of tariff action, of embargoes, proposed tax schemes, and radical changes in economic conditions in foreign countries is flashed by cable to the Washington departments and then relayed to the industry. This is followed by regular reports on business conditions and trends, road building projects, contemplated changes in the manner of administering imports, levying taxes on the motor vehicle, and other handicaps to the extension of the world market for automobiles.

Upon the State Department rests the responsibility for negotiations with other countries to secure fair treatment of American automotive exports. The U. S. Tariff Commission has available the flexible provision of the Act, which provides authority to analyze direct or indirect discriminations against American exports, and to investigate costs of production in foreign countries.

Foreign road engineers are almost constantly in attendance on officials of the U. S. Bureau of Public Roads, the Arlington experiment tests, and various state highway departments.

International conferences on road building and the regulation of automotive traffic are attended by official delegations authorized and financed by Congress.

Plans for an Inter-American Highway are taking shape through the assistance of a special appropriation of \$50,000 which enabled the U. S. Bureau of Public Roads to conduct a reconnaissance survey of possible routes in cooperation with the Central American countries immediately concerned.

An international highway route to Alaska is under the consideration of a commission headed by H. H. Rice.

Motor truck and motor bus impacts on the road have been under study by the Bureau of Public Roads in cooperation with the state highway departments for several years. The virtual elimination of the solid tire from the rural highway was forecast some time ago and is now being written into state laws. Likewise size, weight and speed legislation is being influenced.

Fuel Research Conducted

Fuel research at the Bureau of Standards and the Bureau of Mines has been carried on in cooperation with the industry over a long period. Brake performance codes were developed at the same Bureau with the invention of a decelerometer to permit the easy gagging of stopping ability.

Seven years ago Herbert Hoover, as Secretary of Commerce, took the first official step toward promoting greater safety on the public highways when he summoned a national conference under the direction of his department. From this and subsequent activities have been developed uniform regulatory vehicle laws for states and municipalities, which are now well on the way to adoption in a majority of the states and cities.

Government representatives at all times lend a sympathetic ear to the problems of industry and stand ready to use their facilities to help in any way possible.

JUST AMONG OURSELVES

Capital is an Evidence of Business Ability

HEARD it argued recently that capital is about the best possible gage of the ability of a dealer, whether he be a car dealer, a parts and accessory merchant, or both. Sounds sensible.

It's not important whether he has adequate capital because he is a good business man or whether he is a good business man because he has adequate capital. Point is that if he is a good business man he will have adequate capital to carry on his business properly; and if he hasn't, it's pretty fair evidence that he hasn't been carrying it on properly.

Plenty of retailers get into the automotive business lacking sufficient capital to begin with. But isn't that somewhat a sign of poor business ability to begin with?

Whatever one's theories may be, the fact remains that a vast majority of successful automotive retailers will be found to be those who are adequately capitalized—and this single factor is going to become more and more important every year from now on.

More Cash Sales Are Reported

REPORTS continue to come in of an unusual number of cash deals in new car sales. Indicating, doubtless, a continuance of a very conservative frame of mind financially on the part of buyers.

Profits From Volume Seem the Order of the Day

TALKING about the possibilities of passenger car price increases at this time seems to us to be something in the nature of a midsummer night's dream. Whatever arguments may be advanced concerning factory costs, the competitive situation seems to be so very acute that chances of anything like an upward price movement in the near future are dim.

Most manufacturers of parts and vehicles have settled down to the idea of trying to make money out of volume and prices at present levels with reasonable expectations of at least slightly better volume before snow flies.

Old Man Competition Sets the Pace

EVERY time automotive volume drops, somebody pops up with the theory that prices will have to be higher on account of the lower volume. Just as regularly, old man Competition keeps going his steady pace, usually making prices lower in such periods instead of higher. It's just a matter of one very strong force having greater potency than a number of weaker ones.

Button, Button or What Have You?

SAID a dealer to a factory field man the other day: "Guess this factory accounting system I'm using is all right. But up to now I always thought that 'reserves' meant money. I find by looking over

my books that I've got plenty of reserves, but, by gosh, I know damned well I've got no money."

Now wasn't that dumb?
Or was it?

Will Europe Revive Free Wheeling?

T'S interesting to find British *Motor* in its July 14 issue saying that "the fate which the free wheel has experienced at the hands of European manufacturers forms an unhappy contrast to its transatlantic successes."

This publication, on the basis of tests made several years ago, is quite favorable to free wheeling and chides British manufacturers rather sharply for the "take-it-or-leave-it" attitude which, it says, they adopted in selling free wheeling when they first took it up a number of years ago.

On the basis of its adoption by many U. S. makers, British *Motor* predicts a revival of interest in it among European manufacturers, after stating that during 1930, when free wheeling was first adopted in America, free wheels were quietly dropped by European makers.

Free Wheeling Is A Husky Youngster

FREE WHEELING has been adopted more rapidly than any other feature on American cars since four-wheel brakes suddenly rushed in as standard equipment within a single year some while back.

Since Studebaker's adoption of free wheeling in September, 1930, the list of cars offering this feature as either standard or optional equipment has grown to include: Auburn, Hupmobile, Lincoln, Pierce-Arrow, Plymouth, Chrysler Six, De Soto, Dodge Six, Dodge 8, Essex, Graham, Hudson, Marmon, Nash, and the Willys line.—N.G.S.



Unit-Type Machines Production Changes

This is the third of a series of articles on the replacement of machine tools

By Joseph Geschelin

SPURRED by the irresistible forces of progress, manufacturing principles, particularly those relating to machine-shop practice, are right in the midst of a significant evolutionary phase. We are thinking now of the effects of current developments in machine tools and other types of manufacturing equipment. Those intensely practical men who are making history in automotive production may find it interesting to get a broader perspective of current developments so as to appreciate their full significance.

Progress in the automotive industry is constant change. Change in design; change in methods. Only a few years back, single purpose machines predominated wherever large volume was involved. These machines were expensive but economically justifiable because of productivity and decreased production cost. But a significant thing occurred. Although unit volume was maintained or increased, engineering changes assumed a faster tempo and economically the single purpose machine as such began to pass out of the picture.

Machine tool builders anticipated this trend and met the challenge with what has now developed into the unit-type machine. It answers the major requirements of a special single purpose machine. If anything, it is more rugged, more powerful and, above all, provides a remarkable degree of flexibility and adaptability to engineering design changes. It is not our purpose to make any sweeping generalization. There are still many places where special machines are being used and will continue to be used. Accordingly, it is the purpose of

this article to review briefly the current development of unit machines, their specific applications, and to appraise their economic significance.

In the present state of the art, we may classify machine tools as falling into three general groups:

(1) The standard or universal machine which is used in the smaller machine shops, tool rooms and in general wherever the quantity is relatively small and set-up changes frequent.

(2) Single purpose machines for high production or intricate parts on which the set-up is unchanged for long periods.

(3) Unit-type machines for relatively high production, fixed seasonal set-up but with adaptability to engineering changes in design of the work.

Unit machines only are to be discussed here. And they may be differentiated for our purpose into two broad types:

(1) A class of machines built up from standard units but more or less permanent in character. In this group might be included turret lathes, automatic lathes, vertical turret lathes and power presses. A characteristic of this group is the variability of the tooling which may be salvaged or scrapped but at any rate completely changed in character to accommodate a new design. Naturally this tooling represents an appreciable investment and cannot be changed economically except at stated intervals. A newcomer in this group is the powerful heavy-duty, single-spindle drill press used with interchangeable multiple spindle heads—really one of the most flexible combinations that has ever been developed.

(2) Single purpose machines built up from standard

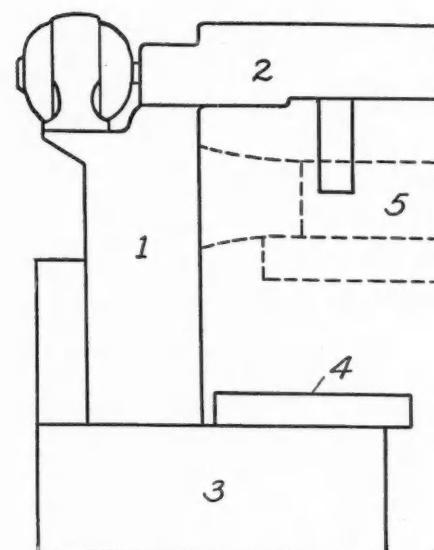
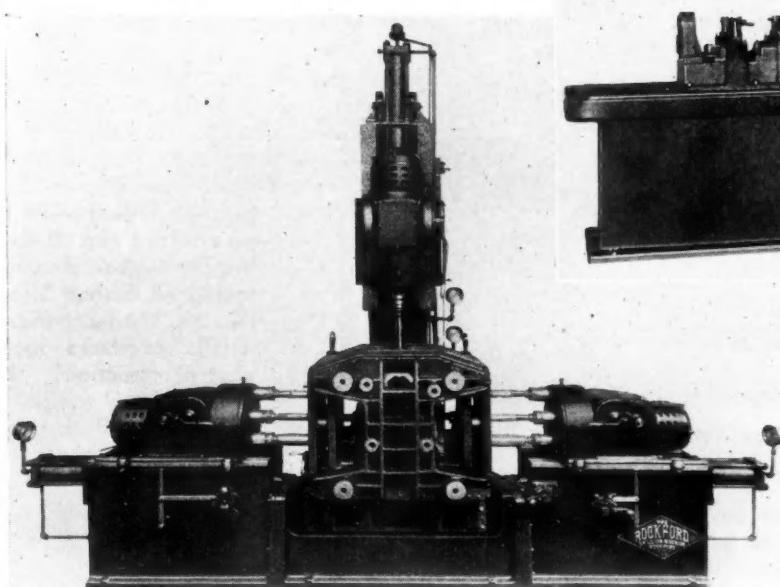
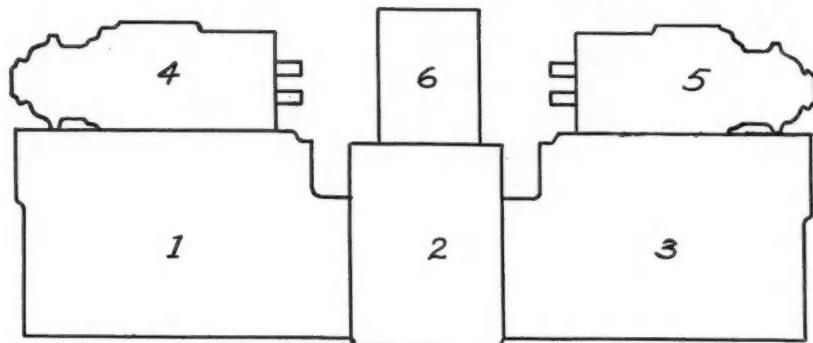


Fig. 1—Schematic drawing of production drill press, showing basic units

Fit the Program of Frequent in Automotive Plants



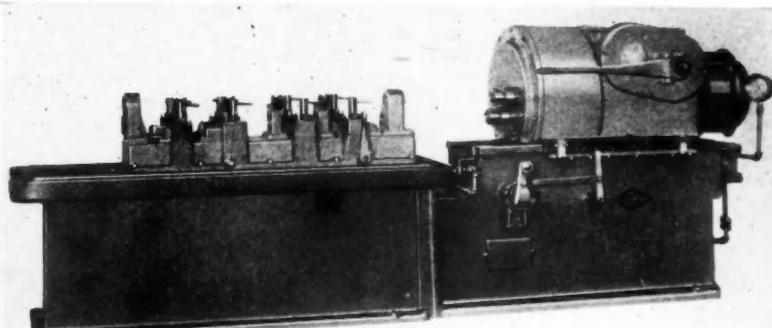
Courtesy Rockford Drilling Machine Co.



units. These units in combination with others make possible a large variety of production machines, simple and complex. The characteristic of these machines is that they may be used not only on a similar class of work but converted to produce parts of an entirely different nature. This classification includes milling machines, boring mills, multiple-spindle drilling machines, multiple-spindle tapping machines and the like. This classification may also include some varieties of the heavy-duty drill press mentioned in class 1.

What adjustment must be made in our thinking when considering unit machine tools? Many of the general factors entering into the selection and replacement of manufacturing equipment were discussed in *Automotive Industries*, July 18, 1931.* The upshot of the

*Planned Buying of Machine Tools With Adequate Sinking Fund Provisions Will Reduce Costs, Page 80.



Courtesy Rockford Drilling Machine Co.

Fig. 4 (above)—A single end crankcase boring machine. Note extra long table and large machine head. This unit is used for a varied line of crankcases by changing the fixture spindle unit + +

Fig. 3 (left)—Example of three-way combined horizontal and vertical machine. After several years of service this machine was converted into a two-way job with one vertical and one horizontal head

Fig. 2—Schematic drawing of drilling machine. Arrangement also typical of boring mills + + + + +

matter is that accounting methods and philosophy must be overhauled if the manufacturing department is to reap the benefit of the new order. This refers specifically to certain phases of depreciation and overhead accounting which were touched upon in this article.

Automotive production demands the use of these modern unit machines. Yet the high depreciation rate imposed by present accounting methods is an artificial burden which is not justifiable by the facts and frequently prevents the factory executive from getting the equipment he needs. And this is intensified by the fact that these machines usually will have a higher first cost than customary.

Now as a matter of fact on most unit machines of simpler form, the tools and fixtures are the only parts which need be scrapped. The basic units are good for a long period of service. In actual practice, therefore, only about 25 to 35 per cent of the machine need carry the heavy depreciation rate, and it can be made heavy enough to justify even present accounting practice.

Let us take a simple example to illustrate the point.

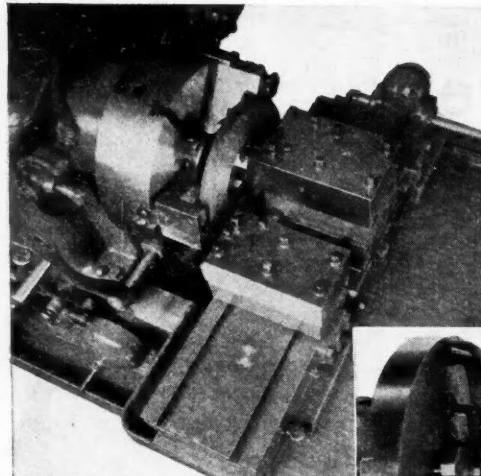


Fig. 5 (left)—Potter & Johnston platen type automatic, showing a close-up of tooling + + + + + + + + + + +

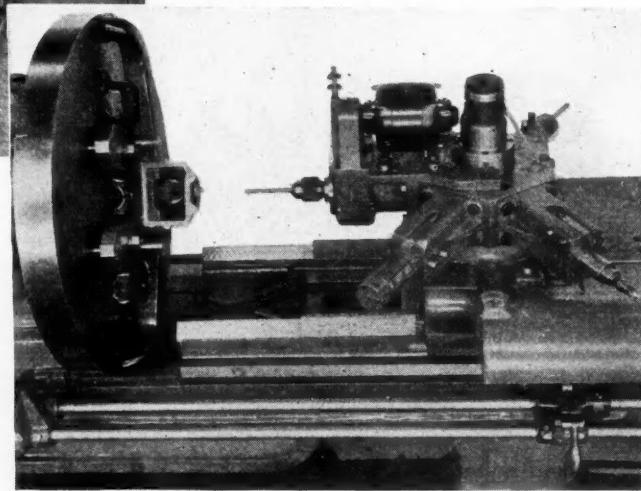


Fig. 6 (center)—Tooling on Foster Fastermatic. Through the use of a drill speeder, small holes can be drilled or reamed, with the work driven at speeds for operations on larger surfaces + + +

Cost of new machine \$5,000.

Special tooling and fixtures \$1,200.

Total \$6,200.

Only \$1,200 of this total is special. It may be depreciated as high as 50 per cent per year, depending upon individual conditions. But the heaviest item of expense, the \$5,000 item, should carry only normal depreciation, which may be, say, 10 to 15 per cent. Here then is the fair and reasonable approach in appraising a new machine and in calculating unit costs. On this basis we may select a machine which will pay the entire cost of tooling and fixtures within a period of one to two years.

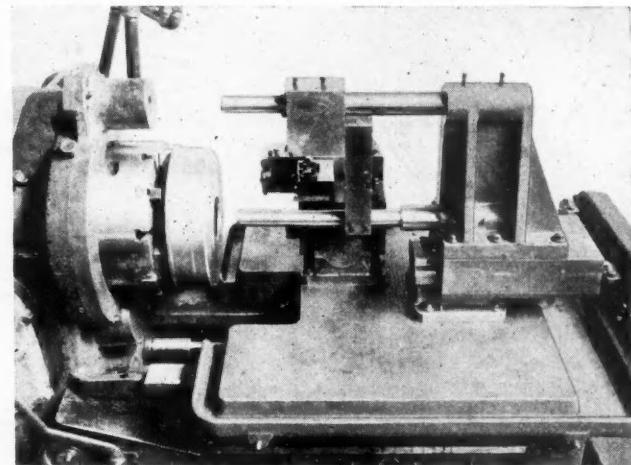
Isn't this reasonable? On this basis, a new highly productive machine may be justifiable, and if the equipment is needed the works manager can probably get the necessary appropriation. If these facts are not taken into consideration, the new machine will be unavailable in many cases.

In general, the flexibility of a unit machine makes it possible to shift it not only from one job to another but from one department to an entirely different one. At any rate, the important thing to bear in mind is that it is not good business nor is it good accounting to depreciate the entire value of this type of equipment and force it to pay for itself within one or two years. Although this high depreciation prevails today, it is practical only where the production rate is very high.

Analysis of Unit Machines

The characteristics of various kinds of unit machines are of great interest to factory executives. A brief analysis of some of these will help to answer the questions which may arise concerning flexibility and the way in which it may be achieved. Consider the heavy-duty drill press which is being used now with interchangeable multiple-spindle heads. Invariably this is a rugged machine with excess power capacity. It is particularly well suited to high production rates. But the most interesting applications are for moderate production with rather frequent set-up

Fig. 7 (below)—First operation on Rolls-Royce brake drum tooled on Gisholt Simplimatic. Note characteristic overhead tool pilot construction +



changes. For example, in one large automobile plant this kind of equipment is being used for a line of three or four different engines similar in design but differing in dimensions. These different models go through the same line progressively simply by interchanging multiple-spindle heads.

A diagrammatic sketch of this class of machine is shown in Fig. 1. It consists of four distinct elements.

(1) The column which may be raised or shifted as desired by filler or offset blocks.

(2) A unit head with a built-in driving mechanism and change gears.

(3) Base.

(4) The table which may be sliding or rotary, depending upon the machine and the nature of the work.

No machining or appreciable set-up charges are required in changing tooling, since the multiple-spindle

attachment (5) may be bolted directly to the head or the column. The driving mechanism is usually provided with a multiplicity of speeds and feeds which give it an unusual degree of flexibility.

Boring Mills

Fig. 2 shows a diagrammatic arrangement typical of horizontal boring mills and multiple-spindle drilling and tapping machines. The elementary form shown here consists of six distinct units—4 and 5 being driving heads and 6 a special fixture.

In many cases this type of machine can be retooled for a similar part simply by changing unit 6, the fixture, and the spindle unit on the driving heads 4 and 5. Many simple and complex machines can be built up from the fundamental unit shown here, also by addition of others. For example, Fig. 3 shows a boring machine with an additional vertical boring unit. Fig. 4 shows a simple form utilizing units 1, 2, 4 and 6.

In this same classification are some special unit machines which vary in physical appearance somewhat from Fig. 1. These are best described as consisting of a number of individually driven heads mounted on a common base. Familiar examples of this type of machine are the units built by Kingsbury, Millholland, Ex-Cell-O and others.

Grinders

The grinder is another type of machine which fits into our conception of unit construction. Grinders are now designed so that units can be fitted to suit the requirements of the

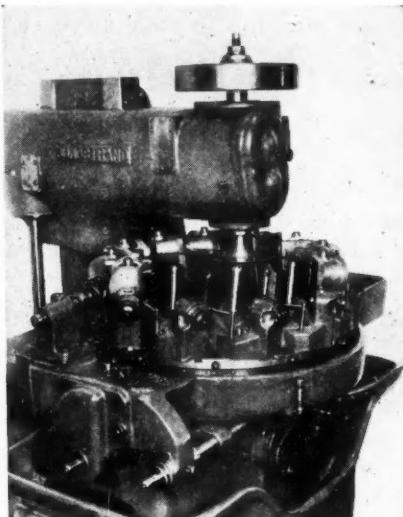


Fig. 11 (above)—Sunstrand 3W-2 Rigidmil with a 24-in. rotary table and vertical head. This illustration shows a set-up for milling a diagonal slit in one side of the piston wall and stamping the word "Front" on the end face + + +

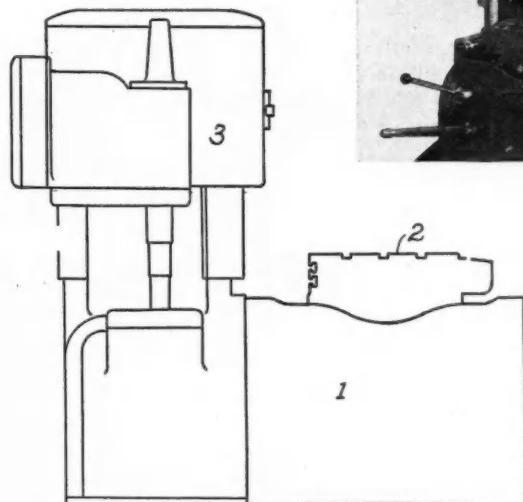


Fig. 8—Automatic polisher and buffer of unit construction by the Hammond Machinery Builders + +

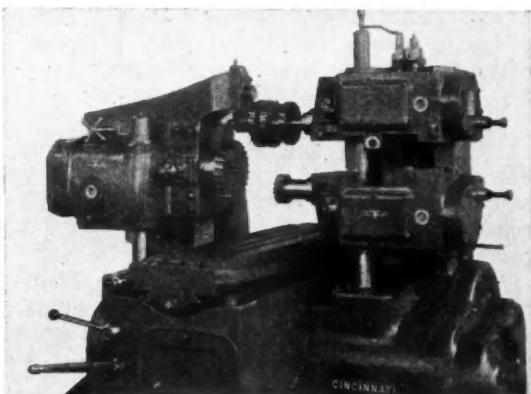
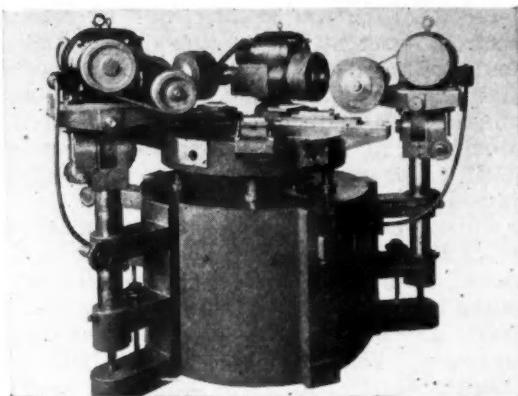


Fig. 10—Rather complex Cincinnati miller built up from standardized units. The top of the left-hand spindle carrier which normally carries an over-arm used to provide support for upper right-hand carrier

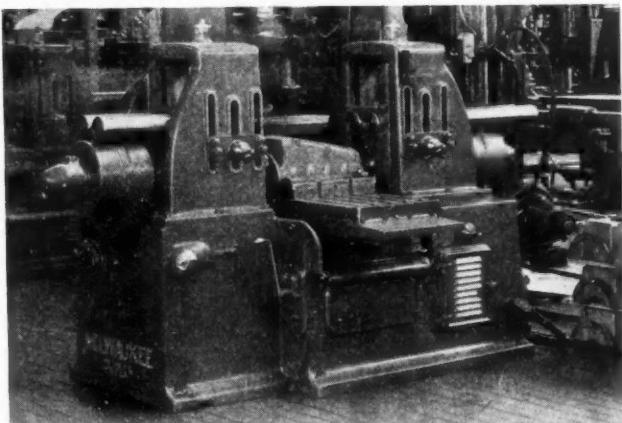


Fig. 9 (center)—Schematic drawing of elementary milling machine + + +

Fig. 12—Milwaukee Duplex No. 1830 set up for milling cast-iron oil pans. There is a 4-in. full-back tungsten carbide cutter on one side, a 6-in. full-back cutter on the opposite side + +

job. A cylindrical grinder may be retooled for an entirely different job by changing the head stock or foot stock and incorporating either live or dead spindles which are interchangeable. In some cases a combination live and dead spindle head stock has been provided. In addition, of course, the machine lends itself to the application of special holding fixtures, gages, etc.

This group also includes the centerless grinder, which is decidedly of unit type and may be readily converted from one kind of work to another within its range by changing the fixtures, the automatic sizing device and the mounting of the regulating wheel, if necessary. Moreover, the Cincinnati Grinders, Inc., recently demonstrated the unlimited possibilities of the centerless grinder by combining it with an automatic hopper and then extending the principle to the operation of an entire battery of grinders, connected through automatic hoppers.

Turret Lathes

Modern turret lathes are essentially permanent machines built up from standard units. The requisite flexibility is obtained through changes in the turret, chucks and tooling. Current models feature a wide range of speeds, feeds and table movements to take care of practically every requirement. Another important feature is the degree of variability in the relation of the turret to spindle. The platen type is even more characteristic of unit construction, inasmuch as the entire slide unit is variable and may be changed to suit the particular requirement. Figs. 5, 6 and 7 show some interesting variations in tooling for automotive production.

In the group of more or less permanent machines built up by standard units, we may include the automatic lathe. Well-known examples are the Lo-Swing, Fay (J&L), Cone and others. The degree of flexibility of current models is really surprising. Usually the change-over from one job to another is accomplished by replacing the tool holders and turning attachments. In some cases it is possible to make a radical change in the machine by installing new tool blocks, a different type of carriage and tail stock. Remember that all these changes are built around the same basic machine.

Polishing and Buffing

Fig. 8 shows a striking new development—a universal automatic polishing and buffing machine recently made by the Hammond Machinery Builders. And it fits right into our picture. As shown in the illustration, the machine consists of a massive base providing support for a work table and any given number of polishing and buffing heads individually driven. The arrangement of driving head and the design of the table are all variable. According to the builders of this machine it answers the following requirements: (1) Presents the work to the polishing wheel face; (2) maintains correct position of work against the face of the wheel; (3) provides the yielding or giving effect of the human hand; (4) passes the work at the correct feeding speed; (5) facilitates redressing the wheel face at proper intervals.

Probably the most prominent example of unit construction is found in the modern production milling machine. Its simple elements crudely shown in Fig. 9 are as follows:

- (1) Base.

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- (2) Replaceable table.
- (3) Spindle head.

Generally the table is available either reciprocating or rotary. The spindle head is also optional either vertical or horizontal. From these simple elements are built up some of the most complex production milling machines used in the automotive field. For example, in the line of Cincinnati Millers, it is possible to build up from standard units 18 plain machines and 18 duplex machines.

Figs. 10, 11 and 12 show the wide range of possibilities in the way of unusual applications of current machines. Most decidedly the present production milling machine is not a special machine in any sense of the word. Certainly there is a lot of salvage value in any machine on the floor.

The foregoing is intended to give a brief composite picture of the fundamentals underlying the design of a certain class of production tools—the unit type. It happens to be the widest used class in the automotive field. Its economic value and desirability in modern production are undisputed and obvious to factory executives. However, if we are to reap the benefit of these machines, the present cost accounting and buying habits must be tuned to the new order.

Unit machines are not special machines. Some are as much as 90 per cent standard. Let depreciation accounting face these facts and clear the way for the master tools of industry.

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Rigidmilling Principles and Practice (descriptive booklet).

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Thanks are due the following companies, who contributed so generously to this study:

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Seneca Falls Machine Co.
Hammond Machinery Builders.
Kearney & Trecker Corp.
Potter & Johnston Machine Co.
The Cincinnati Milling Machine Co.
Superior Machine Tool Co.
The Toledo Machine & Tool Co.

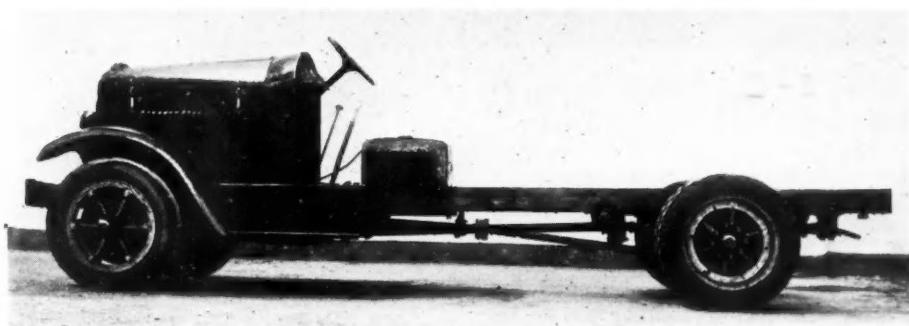
Metal Statistics, 1931

Published by the American Metal Market. 552 pages. \$2.00.

THE twenty-fourth annual edition of the standard work giving statistical information on ferrous and non-ferrous metals. New tables have been added this year. Much of the material consists of market quotations based on daily prices appearing in the American Metal Market.

Automotive Industries

China Builds Its First Truck With Major Units of U. S. Manufacture



THE Industrial Works of the Liao Ning Trench Mortar Arsenal, Mukden, after eighteen months of research, design and manufacturing, has just completed its first truck. To our knowledge, this is the first truck to be manufactured in China. It is called the "Chung Shan" truck, being named after Dr. Sun Yat Sen, whose second name was Chung Shan.

The funds for this operation are obtained from an appropriation of Mex. \$750,000 (U. S. \$180,000) made by the Mukden government for the purpose of industrializing the Arsenal.

The "Chung Shan" trucks are built in two sizes, both in the "heavy-duty" class. The one shown by the accompanying photograph is the Model 75 and is rated as a 1½-2-ton truck. It weighs 4200 lb. without body or load and has ample capacity to carry 2 tons in addition to a standard weight body and cab. The second size is known as Model 100 and weighs 5000 lb. It is rated as 2½-3 tons and is built of correspondingly larger units. Model 75 is supplied with 30 by 5 in. front and 30 by 5 in. dual rear pneumatic tires. Model 100 is supplied with 40 by 8 in. solid rear and 36 by 5 in. solid front tires.

A test run of more than 100 miles over rough country roads has been made with the Model 75. The total weight of truck and load was 10,010 lb., and the truck averaged 10.4 miles per gallon of gasoline.

When the automotive plant is operating at full capacity it can produce 15 trucks per month, but it is not expected that this rate of production will be reached for several months.

While the prices of these trucks have not yet been fixed, it is not intended to undersell imported trucks. Since duty must be paid on all imported parts and materials, their cost is not far below that of an imported truck.

The major units in the "Chung Shan" trucks are of American manufacture and have been purchased from the manufacturers on the same basis as they are sold to builders of American motor trucks. Orders for units in lots of 45 were placed and delivery c.i.f. Chinwangtao specified. Payment was made cash against documents through the National City Bank

of New York. These units were not bought on a price basis, quality and conformity to specifications being the main factors considered. Wherever possible it was insisted that the units conform to S.A.E. specifications.

In commenting on the purchase of American equipment, D. F. Myers, American engineer in charge of the work, made the following statement: "Without exception, we received from our vendors the same consideration and prices that we would have received had we been an American truck builder. One interesting sidelight on this transaction is that there was not one cent of 'squeeze' paid by any company supplying us with units."

While the major units were purchased in America, all other parts were made in the plant in Mukden. The Industrial Works are now in position to manufacture all such parts as fenders, hoods and other sheet metal parts, all frame cross-members and steel castings, wheels, brake drums, propeller shafts, radiators (including cores), bolts, nuts, fuel and oil line fittings, mufflers, exhaust pipe, drag links, springs, spring eye bolts, front axles, bumpers, clutch and brake pedals, fans, fan belts, etc. It is planned to manufacture an increasing number of the smaller components each year, until all except the three major units, the engine, the rear axle and the transmission, will be produced in the Mukden plant.

Attention is called to the wheels which were made by the Arsenal. For several reasons it was decided to cast the brake drum and wheel in one piece. The Arsenal does not have the press necessary to draw the drum from steel plate. The single casting is said to be lighter than an assembly would be, and the necessity of centering the drum and wheel is eliminated. It is believed that this type of wheel will stand up much better on rough roads than the disk or wood-spoke type of wheel would.

It is estimated that purchases of units from the United States will total approximately \$100,000 per year, and it is planned to continue purchasing at the rate of 45 sets every three months. Requests for quotations will be sent out at intervals of about six months, and changes in sources of supply will be made whenever improvements in the units or reductions in prices warrant.

Reported by the Automotive Division of the Department of Commerce.



The fuselage frame of the Kellett K-2 is built entirely of chrome-molybdenum steel tubing + + + + +

Kellett Designed

ATWO-SEATER autogiro specially designed for private use is now being offered the public by the Kellett Aircraft Corp., Philadelphia. The two seats are located side by side, and dual control is provided. There is plenty of room for two persons in the cockpit, which is cowled in to give protection from the wind, and is upholstered like an automobile. Fitted with a Continental A-70, seven-cylinder, air-cooled, radial engine of 165 hp., the ship weighs 1550 lb., and has a cruising speed of 80 m.p.h., while the maximum speed is given as 100 m.p.h. The price of the ship is \$7,885.

While the design is based on the Cierva patents, it embodies a number of new features that specially adapt it for use by private owners lacking the service facilities of airports. As is generally known, an autogiro is a type of aircraft in which the lift is due to a rotor mounted above the fuselage, which is set in rotation by power from the engine before taking off, and kept in rotation by the air currents striking it while the machine is in the air. In addition to the rotor, the autogiro has very small fixed wings, primarily intended for stability, but also contributing in a small measure to the lift, depending on conditions of operation. The machine is capable of stable vertical descent, and, in that case, the lift is due entirely to the rotor.

The autogiro has two principal advantages over the conventional airplane. Its ability to descend vertically permits the operator to fly at high altitudes right up to the edge of his landing place, select the exact spot on which he wants to land, and glide down to it at a very steep angle, correcting or altering that angle in accordance with weather conditions. This is of particular importance in cross-country flying to the person lacking the skill necessary for landing at high speeds.

The Autogiro Cannot Be Spun

The other advantage of the autogiro is that it cannot stall or lose stable flying speed. The rotor itself always retains its speed while in the air, and the machine cannot be spun. While vertical landings are possible, they are considered more or less as stunt or emergency landings. The normal landing with an autogiro involves gliding to the earth at an angle of about 45 deg., and then using the rotor as an "air brake" to reduce the speed to 10-12 m.p.h., whereupon the use of the wheel brakes usually brings the craft to a stop in about its own length. The figures given

apply to landing in still air; against a head wind, the machine can be set down with practically no forward speed at all.

In taking off with the autogiro, the rotor is first brought up to speed from the engine by means of a friction clutch, which will slip until the speed of the rotor corresponds to that of the idling engine. The rotor is then accelerated further, up to about 110 r.p.m., by speeding up the engine gradually. The wheel brakes are then released and the rotor clutch is automatically disengaged, the throttle is opened and the ship starts. Thereafter, the air currents created by the motion of the ship through the atmosphere keep the rotor in rotation, bringing its speed up to about 130 r.p.m. in normal flight.

As a matter of fact, the speed of the rotor does not change much so long as the ship is in the air, whatever its speed may be. This is due to the fact that the rotor system is so designed that it automatically adjusts itself for approximately constant velocity of air inflow through its disk of rotation. During vertical descent the speed of the rotor relative to the air is comparatively small, but the air current then is perpendicular to the disk; when moving forward on the level, the speed relative to the air is much greater, but the angle of attack of the rotor disk is less.

The fuselage frame of the Kellett K-2 is built entirely of chrome-molybdenum steel tubing welded together as a unit. A triangular structure projects from the lower part of the fuselage to carry the hinge points of the very wide tread undercarriage. This structure also gives a very stiff fuselage, in spite of the wide cockpit. In making vertical landings, it is obviously essential that the shock-absorber action of the wheels be vertical, for if the wheels were to spread as in an airplane, it would put too much side loading on the tires. This low hinge point on the Kellett autogiro permits the use of a tubular strut construction throughout without wires and stays.

The fixed wing is of larger dimensions than ordinarily seen on autogiros. Its design is very closely related to that of the rotor system, and while it takes a certain small portion of the total load of the craft in normal flying, its primary purpose is to serve as a controlling factor in the behavior of the rotor system in flight.

There must be a nice relationship between this fixed wing and the rotor system, for it can be seen that at extremely low speeds, or in vertical descent, with no forward speed, the rotor is carrying all of the load;

Autogiro K-2 is a Two-Passenger Plane for Owners Without Airport Facilities

but as the speed of forward motion increases, the fixed wing carries an increasing portion of the load (up to 30 per cent in the case of the Kellett autogiro), thus permitting the rotor speed to remain constant at all times. The wing is built up of box spars with wood ribs, fabric-covered.

The upturned wing tips provide lateral stability and automatically bank the ship at the proper angle when the rudder is used, making the operation of the ailerons practically unnecessary, except for corrections of rough air conditions. In fact, the chief utility of the ailerons is found usually at extremely low forward speeds. A prolonged sideslip is said to be impossible with the K-2. The ailerons are of the Friese type and are operated by push-pull rods.

Rotor Blades Built Around Steel Tubes

Each rotor blade (or rotating wing) is built around a tubular spar of large-diameter, chrome-molybdenum, seamless steel tube, heat-treated to 150,000 lb. per sq. in. The almost symmetrical airfoil section is maintained by the use of approximately 50 plywood ribs, each of which is riveted to a chrome-molybdenum steel collar, which in turn is pinned to the spar with nickel steel pins fitting tightly into reamed holes. This collar fits the tube so tightly that a special tool must be used to put it on. The leading edge is formed of plywood, and the blade is completely covered with fabric. The trailing edge is of stainless steel strip of wedge-shaped section, and is fastened to the rear ends of the ribs. An interesting characteristic is the arrangement of slip joints in the trailing edge of each rotor blade at intervals of approximately 4 ft. Their purpose is to permit a definite degree of flexibility of the blade as a whole in the plane of rotation without buckling the trailing edge. Flexibility of the blades in both the horizontal and vertical planes is a very important feature.

The rotor pylon is unique in that the large-diameter front member carries all of the starting and braking torque and most of the lift, but no side load. It has been designed for an ample factor of safety for such

loads, and is hinged and pinned parallel to the longitudinal axis at its lower end to a fuselage structure built for that purpose.

Control is by the conventional stick and rudder pedal system, the Friese ailerons being operated by push-pull rods, and the elevator and rudder by direct cables. At the left of the cockpit are found two interlocking levers, one of which controls the rotor clutch, and the other the rotor brake. The throttle is on the instrument board. Rudder pedals operate the wheel brakes either together or independently. A crank in the center of the cockpit is used to compensate for loads on the elevator, for although practically all the variable loading is carried close to the center of gravity, some adjustment is necessary to maintain perfect trim, hands off. This is done by spring-loading the elevator. Failure of the spring would not impair the proper functioning of the elevator control. The rotor clutch is automatically disengaged immediately before take-off.

The following standard instruments are included in the equipment: Compass, airspeed indicator, altimeter, engine tachometer, rotor tachometer, oil-pressure gage and temperature gage.

A Heywood air starter is provided for the engine, and an engine-driven clutch starter for the rotor. The wheels of the undercarriage carry 10 x 6.50 tires, and are fitted with brakes, while the tail wheel is fitted with a 10 x 3 in. tire.

The landing gear has a 12-ft. tread, and the oleo struts have a 10-in. range of action. This long travel of the oleos, combined with the 10-in., low-pressure tires, serves to absorb the shocks due to landing. It is said to be very difficult to bounce an autogiro, fitted throughout with oleo shock absorption, on landing. The rotor, of course, has considerable lift at the time of contact with the ground, and at this moment the load is taken from the rotor, which then flattens out and materially reduces its angle of incidence. As the autogiro is making a vertical or almost vertical landing, the weight of the ship is transferred slowly from the rotor system to the undercarriage.

The pneumatic-tired, roller-bearing tail-wheel is also
(Turn to page 211, please)



The landing gear of the Kellett K-2 has a 12-ft. tread. The tires are two 10 x 6.50 and the tail-wheel 10 x 3 + + +

Creeping Salts of Automotive Storage

The principles underlying the formation of corrosive salts point way to preventative and curative measures

EVERY user of storage batteries, and particularly the motorist, is familiar with the phenomenon of creeping salts, which form particularly at the points where the terminals extend through the covers of the cells and at the junction of the clamp with the terminal. The salts will appear also in cracks in the sealing compound, in cracks in the wooden case (if one is used) and on the nails. A close examination will reveal that the formation of creeping salts is generally most pronounced at the positive terminal of the battery.

These creeping salts are an indication that the battery has not received proper care, and they are the cause of rapid deterioration. It is therefore of interest to explain the principles underlying the formation of these salts, the deterioration which they may cause, and the preventative and curative measures which can be applied to the case, writes G. Gory in *La Vie Automobile*.

In a general way the creeping salts are the result of chemical action of the sulphuric acid solution which forms the electrolyte, on the various metals with which it may come in contact outside of the cells. The acid escapes from the cells by capillarity and under the effect of shocks and of gassing within the cell. The action is chemical and electro-chemical.

Contact of the acid with the lead terminals cannot produce any serious effect. In fact, when the acid is spread over the solid lead, it produces a dense layer of lead sulphate which prevents the chemical effect from penetrating to any depth. The phenomena, however, are complicated by reason of the electro-chemical action of the current. Let us examine the sulphate which has formed on the positive terminal strips on the inside of the cell. As a result of shocks and of its ascension by capillarity, the sulphate has become saturated with acid in contact with the mass of the electrolyte. This sulphate takes part in the reactions of charging, and it is gradually replaced by lead peroxide (the positive terminal being considered). During periods of rest the acid rises in the pores of the peroxide and attacks the lead higher and higher up. It is for this reason that the positive terminal becomes discolored progressively and gradually high and higher. The ef-

fect on the negative terminal is less pronounced, but it is rendered slightly porous by successive charges.

If the passage of the terminals through the covers is not sufficiently tight, the formation of oxide continues, and when it has reached the outside, the layer of peroxide forms a veritable wick which draws electrolyte from the cell and delivers it to the parts on top of the cell. The effect is most pronounced on the positive terminal of the positive-end cell for two reasons: In the first place, it is more difficult to keep this terminal tight in the cover, because of the inevitable stresses on it during installation; secondly, the electrical connection calls for the use of metals other than lead. In fact, the cable is of copper, the clamp of brass (copper and zinc) covered with a thin layer of lead intended to protect it against the acid; and, finally, clamp bolt and its nut are of iron, lead-coated like the clamp (Fig. 1). If the acid is "left alone," it has a great chance among all of these different metals.

The acid first of all attacks the lead, forming white lead sulphate. Passage of the current produces a reddish peroxide of lead. When the lead coating has disappeared, the contact of the acid with different metals produces regular electric cells, which are short-circuited and whose currents provoke or facilitate reactions between the liquid and the metals. If we add to this the electrolysis produced by the currents of charge and discharge and the secondary reactions, we have for a result the formation of materials which differ greatly with respect to their chemical composition and their color, including white lead sulphate, brown lead peroxide, blue copper sulphate, green iron sulphate, white zinc sulphate, etc., in various proportions.

The salts thus formed receive and retain the acid, which continues to arrive from the interior of the cell by capillary action or by projection, and the reaction continues. The new products of reaction push back those already formed, together with crystals from any that were dissolved by the acid, toward the periphery, which explains the peculiar shapes of the salt formations.

Reactions and deposits may also occur in the cracks of the sealing compound, the cracks of the wooden box.

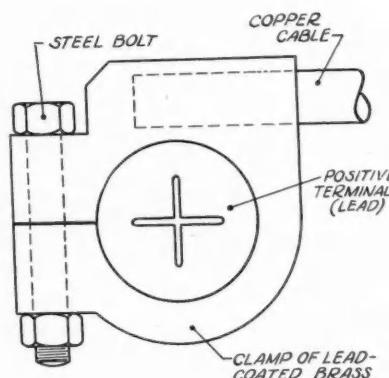


Fig. 1 — Parts on which the formation of creeping salts occurs chiefly + + +

Batteries Indicate Deterioration

On storage batteries other than those of the lead type (which latter has been considered exclusively in the foregoing) salts similar to those mentioned may form, but the nature and the force of the reactions vary with the metals of the plates, with the materials of the cells and electrodes, and with the nature of the electrolyte.

The disadvantages of this salt formation are very serious, even if we disregard the esthetic side, which nevertheless has its importance.

Creeping salts saturated with electrolyte may cause important losses if they are allowed to develop until their form shunts across adjacent terminals. Between the terminals of the same cell the distance is generally too great, but if the cells are thin (of small size) the terminals of adjacent cells may be close together. The salts may then extend from one terminal to another, which would have the effect of short-circuiting perhaps two cells. The latter will then become rapidly and completely discharged, which results in a serious sulphatation if one does not take immediate preventative measures.

The short circuit may result not only from the connection of two terminals but also from the connection of one terminal to ground. In that case, all of the cells between the grounded terminal and ground are short-circuited, the positive terminal of the positive-end cell being subjected most to salt formation. This seems to be an argument for grounding the positive side. If this terminal is normally grounded, additional grounding by creeping salts does no harm. The argument in favor of grounding the positive is of no great importance, however, as we shall see that careful maintenance is a very powerful preventative against salts. It, therefore, makes no difference whether the positive or the negative terminal is grounded.

Corrosion Increases Electrical Resistance of the Cells

Another disadvantage results from corrosion of the terminals and clamps by the acid. The metals which normally carry the current are then partly replaced by the salts, which are less good conductors. As a result, the electrical resistance of the cells increases. This translates itself during charge into an increase in output for a constant-current generator, and in a decrease in output for a constant-voltage generator. In any case, there is a change in the rate of charge, and a disturbance of the equilibrium of battery operation. Moreover, in the case of output regulation (by third brush), an increase in voltage of the generator and of the consuming devices accompanies the increase in current, which may shorten materially the life of the lamps and even that of the generator. When the battery furnishes current alone, the pressure is low, by reason of the pressure drop due to the poor contact. The engine starts sluggishly, and the relatively strong current passing through a conductor of small section may generate so much heat as to cause the fusion of metal in the neighborhood of the poor contact. The

trouble may become still more serious, and the clamps may be corroded to such an extent as to become formless pieces which must be replaced.

Creeping salts may prove the cause of other troubles. These salts may be drawn into the cells, since the sealing of the latter is defective. The metals (copper, iron and zinc) which they contain then react with the active materials of the plates, sulphating and disintegrating them. In this connection mention should be made of the grave mistake made by some persons who throw the salts back into the cells, thinking thereby to restore the latter.

As in the case of every malady, one must distinguish between preventative and remedial measures.

The problem should be considered first by the manu-

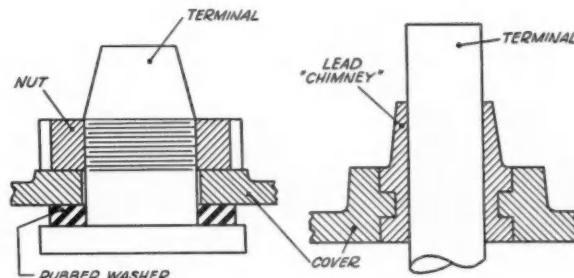


Fig. 2—Methods of rendering the passage of the terminal posts through the cover acid-tight + + + + + + +

facturer. Since the salts cannot form except in the presence of the acid, the cells should be so made that the acid cannot escape. The first passage to be stopped up is the filling orifice, which is provided with a plug. This plug permits communication with the outside only through holes which produce a baffling effect, which let the gases pass, but prevent the escape of droplets to a certain extent. In storage batteries intended for use on motorcycles, where the vibration is particularly severe, the escape of acid may be limited by placing above its normal level a perforated hard rubber plate.

The second leakage path for the liquid is at the passages of the terminal posts through the covers, and the designer should make his best efforts to render this passage difficult. In Fig. 2 are shown two arrangements which assure a tight joint—the one shown at the left by clamping a rubber ring, and the one on the right by means of a lead "chimney" molded into the hard rubber cover and ultimately soldered to the terminal post. Finally, it is advisable to see that a substantial layer of lead covers the clamp ring and its clamping bolt.

Once the battery is installed on the vehicle, it is the duty of the operator to take certain precautions, in order to prevent the formation of the undesirable salts. Thus, every week or every 14 days the tops

of the cells should be carefully wiped off when they are filled with distilled water, with the object of removing all traces of acid, which will be found there in spite of all precautions the manufacturer may have taken. A clean rag will serve this purpose if the amount of liquid on top of the cells is small. If it is considerable in volume, it may be advantageous to slightly soak the rag in soda or ammonia, which neutralizes the acids. This is followed up with a rag soaked in water and finished with a dry rag.

In order to limit the effects of subsequent projections, one may, if there seems to be need for it, tighten the joints where the terminals pass through the cover, and in any case the sensitive parts should be covered with a coating of some material on which the acid has no effect. This coating usually consists of a neutral oil or grease, such as cylinder oil, cup grease or vaseline. Care must be taken not to introduce any oil or grease between parts between which there must be good electrical contact, in order not to increase the resistance. But these protective agents must be spread on certain hidden surfaces, such as the undersurfaces of the clamps and the bolts; these must not be forgotten because they cannot be seen. Leaded grease should be particularly suitable for this purpose, because it is a fairly good conductor.

In conclusion, we will point out the remedies to apply if salts have been allowed to form on the terminals of a battery. If the trouble is not as yet very serious, it suffices to scrape off the salts with a wooden scraper, and then apply the maintenance method outlined in the

foregoing. No metallic scrapers should be used, as they might cause short circuits, thus endangering the cells, and risking the ignition of the gases which are always present in the cells after the charge has been completed.

If the formation of salts is well advanced and the clamps have started to corrode, the latter should be removed for a thorough cleaning. Since the salts act as a cement, removal of the clamps may be difficult. The joints may be softened by pouring water, soda, or ammonia over the clamps, but in no case should excessive force be applied, as that would be likely to injure the terminals or the covers. If circumstances require, a special type of pincers may be used, which takes the support on top of the terminal post and lifts up on the clamp. After removal, the clamp should be plunged in ammonia, thoroughly cleaned with a wire brush and coated with grease after having been replaced. The same treatment is applied to the bolt, but if the threads have been badly corroded, it is better to replace it. Naturally, while the clamp is removed one takes advantage of the fact to clean the exposed parts of the terminal posts. If the post has been injured, it may be well to provide a good bearing for the clamp by means of the lead-burning torch. A clamp that is seriously injured should be replaced.

The attack on the wooden case is hard to stop once it has well started. The acid soaks deeper and deeper into the wood fibers and completes the destruction of the box, which is no longer pleasant to look at and of little practical value.

Deere General Purpose Tractor Tested by the University of Nebraska

OFFICIAL tractor test No. 190 of the University of Nebraska was made on a John Deere General Purpose tractor, manufactured by the John Deere Tractor Co. of Waterloo, Iowa. The tractor is being marketed without a manufacturer's rating; its highest permissible rating under the S.A.E. and A.S.A.E. tractor rating codes is 15.52 drawbar hp. and 24.30 belt hp.

The tractor is equipped with a two-cylinder horizontal L-head engine of 6 in. bore and stroke each, operating at a speed of 950 r.p.m. Inlet and exhaust valves have throat diameters of 2 7/32 in. each. The carburetor is a Schebler 1 1/2 in., the governor of the manufacturer's own make, of the centrifugal type, and the magneto a Fairbanks-Morse. A Donaldson centrifugal and oil-fiber type air cleaner is fitted. Lubrication is by pressure feed. The belt pulley has a diameter of 13 1/8 in., a face of 6 7/16 in. and runs at 950 r.p.m.

The clutch is of the John Deere Company's own make, of the disk type and operated by a hand lever. Three geared speeds are provided, the nominal tractor speeds being 2 1/4, 3 and 3 1/4 m.p.h., while the reverse speed is 1 3/4 m.p.h. The drive to the rear wheels is by enclosed gears and chain.

The tractor has four wheels, of which the two rear are driven. The driving wheels are 44 in. in diameter and have a 4-in. face. Equipment for the wheels includes spade lugs (24 per wheel) 4 in. high by 3 1/4 in. width of face, and extension rims 6 in. wide, with 12 spade lugs per rim, of the same size as those for the

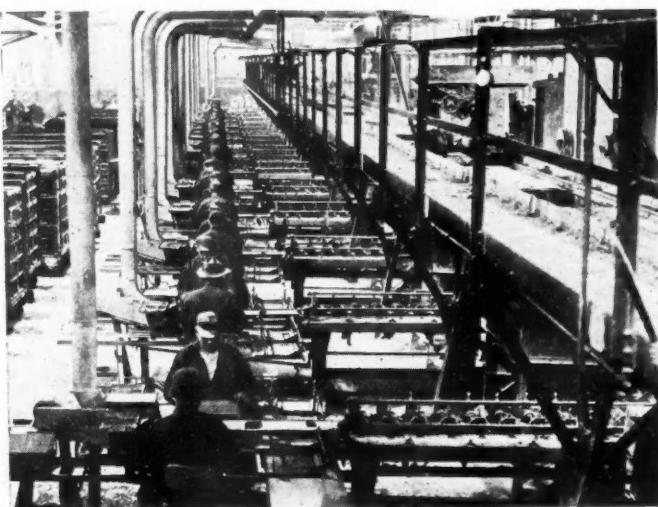
wheels. The total weight of the tractor with operator, as tested, was 4925 lb.

In the maximum-load test the engine developed 25.36 hp. at 949 r.p.m., with a fuel consumption of 0.729 lb. per hp.-hr., the fuel being distillate, weighing 6.93 lb. per gal. During the test the air temperature was 71 deg. and that of the cooling medium 203 deg. In the varying load test the engine developed 24.22 hp. at 954 r.p.m. with a fuel consumption of 0.735 lb. p. hp.-hr.; 12.13 hp. at 968 r.p.m. with a fuel consumption of 0.932 lb. p. hp.-hr., and 6.02 hp. at 977 r.p.m. with a fuel consumption of 1.585 lb. p. hp.-hr.

In the drawbar test in intermediate gear the tractor developed a drawbar pull of 1702 lb. at 3.38 m.p.h. (15.34 drawbar hp.) at a fuel consumption of 1.096 lb. p. drawbar hp.-hr. In what is known as the maximum load test the tractor developed a drawbar pull of 2853 lb. at 2.48 m.p.h. (18.86 hp.) in low gear; 2137 lb. at 3.30 m.p.h. (18.82 hp.) in intermediate gear, and 1265 lb. at 4.75 m.p.h. (16.02 hp.) in high gear.

No repairs or adjustments were made during the tests, which included 53 hours of operation.

Effective June 16, 1931, the duty on automobiles and on trucks of less than 3360-lb. carrying capacity imported into British East Africa (Kenya, Uganda and Tanganyika Territory) was increased from 10 per cent to 15 per cent ad valorem, according to a cablegram from Consul K. de G. MacVitty, Nairobi, Kenya.



PRODUCTION LINES

Production Lines of the Industry No. 3

Back of the performance of the storage battery is the fundamental operation of plate pasting. Visitors to the plant of the Willard Storage will see this department at work as shown here. Control is a vital matter. All air is excluded from plates by the machines. Temperature and humidity have such an influence on quality that room temperature is not permitted to vary more than 3 deg.

Line 'Em

Be it green sand or dry a cylinder block is a tough baby to core. And how well foundry men know it. Particularly when it's one of these new Vees. Is it violating a confidence to whisper that rejects often run atrociously high? Why not a "wet" liner? A simple inserted sleeve to eliminate cylinder walls and complicated water jacket coring. May slash foundry costs and reduce rejects.

Improves Tolerances

Automotive Industries, Aug. 16, 1930, featured an outstanding article comparing manufacturing tolerance systems used in the automotive field. W. L. Hindman, coauthor of this article, gave us some new dope the other day. He has just copyrighted an edition embracing the tolerance or bull's-eye method. With new tables of automobile fits, Hindman's tolerance numbers which appeared as table 4 in the article have been extended. Now goes to 40 V to include drive and slip fits.

Give 'Em Figures

G. Charter Harrison recently urged executives to present facts in simple form. To get figures which tell their story quickly and accurately. He'll like the way budget figures come through in many automotive plants. To our mind the biggest advance is the idea of giving operating figures to foremen and other factory executives.

Old Turnings

The principle of interchangeability of parts was developed by Sir Marc Isambart Brunel for use in the manufacture of ships' blocks,

of which a full-rigged frigate had about 1500 varieties. The idea came to Sir Marc at Alexander Hamilton's dinner table. First working models of the machines for quantity production of block components were constructed in England about 1801. Each machine was designed to perform its part in a definite series of operations. A plant was set up and got into full production around 1808, when 130,000 blocks were turned out.

Training Cooperatives

Brown & Sharpe apprentices have taken special instruction in machine design at Brown University. According to a recent announcement, the company agreed to reimburse one-half the tuition fee to those completing the course while employed.

Organize Oiling

Proper lubrication of plant equipment pays dividends. It's preventive maintenance. Biggest step forward in years is centralized automatic plant lubrication. Machines in each department piped to automatic unit. Each one gets right amount at the right time. Cuts maintenance; reduces breakdowns.

Did You Know That—

According to our favorite welding expert a certain popular sedan (name on request) boasts the following welding statistics:

1750 spot welds
42 in. of oxyacetylene
15 in. metallic arc
216 in. electric flash welds.

Which bears out our pet theory that the body industry has harnessed practically every phase of welding technique.

Keeping Pace

Another chapter in industrial progress is written in "Grits and Grinds," Number 5 for 1931 (Norton Company's house organ). The modernization of their machine division is summed up succinctly:

"Without adding a single square foot of floor space to the division's area, its capacity has been increased 25 per cent by a program of department relocation and rearrangement, reequipment and the installation of a new incentive system.

"This modernization has brought about progressive manufacturing, reduced manufacturing time, improved delivery service and makes possible the retention of Norton standards of quality with greater ease to the workmen."

Improved Lighting

Improved lighting is a feature of the new order. General overhead lights have replaced individual sources in this plant. Except in certain quarters, shadows are eliminated by means of suitable reflectors, thus bettering working conditions.

Golden Rule

Did they practice what they preach about modernizing equipment? Decidedly yes. Floor space was conserved; productivity increased through the installation of new and adequate machinery. Overhead shafting and pulleys gave way to individual drive. About 200 ft. of shafting and more than a mile of belting were eliminated.—J. G.



Checker Utility Vehicle Is Truck or Passenger Car

CHECKER CAB MFG. CORP. has introduced a convertible all purpose car, under the name of Checker-Utility, to sell at \$1,795 f.o.b. Kalamazoo. This new car can be used either as a light truck or as a passenger car, being readily convertible from one to the other in a few minutes time, and without the use of tools.

As a passenger car, the Checker - Utility, with its wide front and auxiliary seats, can hold nine persons. With the auxiliary seats folded over, the back cushion of the rear seat folded into the top, and the seat cushion of this seat folded completely over forward, the car becomes a one-ton truck. Or with the back cushion folded into the top, the seat cushion raised to a vertical position, and the auxiliary seats left open, it becomes a half-ton truck with capacity for carrying six passengers as well.

As a truck, it can be loaded either through the side doors of the rear compartment, or through a drop gate at the rear of the car. This drop gate is so fitted as not to mar the appearance of the car when it is in use as a passenger car. It may also be opened, however, when the car is being used for passenger carrying purposes, to serve as a luggage carrier in the rear of the car.

The car is built on a standard Checker cab chassis,



Arranged as a passenger car the Checker-Utility has seats for nine + + + + + + + + +

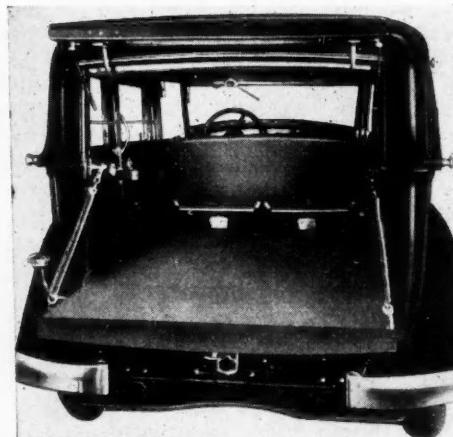
powered with a six-cylinder Buda engine developing 61 hp. at 3600 r.p.m. It has a wheelbase of 122 in., is equipped with Wagner hydraulic brakes, Gabriel triple hydraulic shock absorbers, non-shatterable glass throughout, and carries six heavy-duty tires as standard equipment.

The windows of the rear compartment are so arranged that when the car is being used for business, panels can be easily placed over

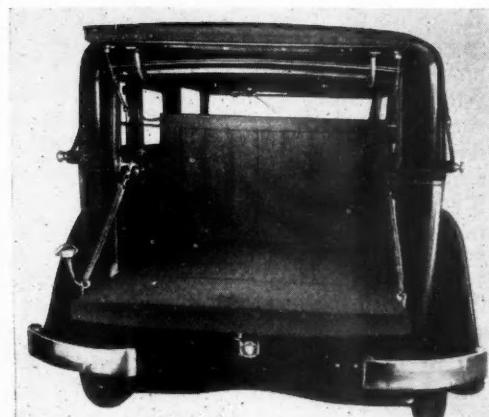
them to carry the owner's business advertising. These panels can be as easily removed, so that little labor is involved in the conversion from a business vehicle into a passenger car. With the ruggedness and riding qualities of a cab, and the appearance of a passenger car, it is felt that this new product should find a ready market for combined heavy-duty and pleasure use.

It is felt that this car should find a ready market among small merchants who want a delivery truck during the day, but would also like a car for personal use during evenings and weekends. Some of them already have been made up specially for undertakers to use as combined ambulance, hearse, and funeral car.

The car has been approved by the police department of New York City for hacking license.



(Left) — Here the Checker-Utility car is arranged as a 1-ton truck + + +



(Right) — In this arrangement it has a capacity of 1/2-ton in addition to seats for six persons + +

Comprehensive Study of Air Filters Made by the University of California

Tests Made in Five Groups

1. Dry Filter
2. Dry Centrifugal Filters
3. Low-Restriction Oily Filters
4. Self-Washing Oily Filters
5. Miscellaneous Types

THE subject of air cleaners for tractor and automobile engines has nowhere received more attention than in California, where, owing to the gritty nature of the dust, the problem of its removal from the carburetor air seems to be particularly acute. Professor A. H. Hoffman of the University of California has studied the problem of air cleaning for a considerable number of years and has tested many commercial air cleaners as to their efficiency and their effect in reducing engine power. Some of the earlier work done by him on air cleaners for tractors was published in a bulletin of the California Agricultural Experiment Station in 1923. Since then samples of practically all of the new air cleaners that have appeared on the market were obtained and submitted to tests with respect to their efficiency in separating dust as well as with regard to the restriction which they introduce in the induction line. Most of these air cleaners are designed primarily for passenger-car and truck engines, while a few are for tractor engines. These tests, which were made at Davis, Calif., are reported in Bulletin No. 499 of the University of California, Air Cleaners for Motor Vehicles.

The cleaners tested were divided into five groups, viz., dry filters, dry centrifugal cleaners, low-restriction oily filters, self-washing oily filters and metal surface types and miscellaneous types. Tests were made on 88 different cleaners, and the specifications of these cleaners are given in tabular form in the Bulletin, in addition to which illustrations of the different devices are included. The classification given above is not a rigid one and several of the cleaners have to be included in more than one class.

The characteristics demanded of air cleaners for motor vehicles are enumerated as follows:

1. Efficiency in separating dust from air.
 2. Low restriction on air inlet.
 3. Compactness.
 4. Infrequent need for servicing.
 5. Simplicity in design and construction.
 6. Freedom from troubles.
 7. Ability to muffle carburetor noises and to prevent ignition of gasoline by backfires.
 8. Neatness, sturdiness, durability and low cost.
- An inefficient air cleaner, Professor Hoffman ob-

serves, has no right to a place under the hood of a motor vehicle, but the car owner is unable to tell from road performance whether the cleaner is performing its function or not. Since the majority of modern engines are well built, and most of our roads are comparatively dustless, satisfactory engine wear is frequently obtained even with

an inefficient type of cleaner, merely because severe dust conditions are never encountered. The presence of such air cleaners breeds a false sense of security in car owners. If such a machine is operated for an appreciable length of time over roads where volcanic ash abounds, the engine quickly shows abnormal wear.

Next in importance to cleaning efficiency is the restriction effect, which may possibly become so large that carburetor action is interfered with and loss of power and waste of fuel result. During 1929, owing to the general rise in road speeds, designers of air cleaners made determined efforts to reduce this effect, so that carburetor action might not be interfered with even at racing speeds. In some of the new cleaners efficiency is sacrificed to freedom from restriction, while in some others the two requirements are both satisfactorily met.

Space under the hood is usually at a premium and therefore the smaller the cleaner can be made and still do its work satisfactorily, the more acceptable it will be. Also, the simpler it is in construction and the fewer the moving parts and connections to exhaust and intake manifolds, the better.

Some automobile manufacturers are said to insist that no air cleaner which requires attention or servicing is acceptable for inclusion as standard equipment, but Professor Hoffman notes that if this point were strictly adhered to it would bar out all cleaners. Such parts as tires, batteries, oil filter, etc., are given periodic attention, and it seems absurd to refuse it to such an important device as an air cleaner. Some of the best cleaners will serve efficiently under normal dust conditions for upward of a year without attention, but each air cleaner sufficiently efficient to be worthy of the name should be given attention at least as frequently as the oil cleaner, that is, once every 1000 miles to every 10,000 miles. As bearing on the importance of keeping the air cleaner in a serviceable condition, Professor Hoffman observes that many a power-farming venture

has failed almost wholly because of the carelessness that, among other things, allowed the air cleaner to be forgotten.

Many air filters effectively muffle carburetor noises. Some also undoubtedly reduce the danger of gasoline being ignited by back fires. The principle involved is the same as that of the Davy safety lamp, formerly much used by coal miners to prevent explosions when inflammable gases came into contact with the flames of ordinary candles or wick lamps. Many modern air cleaners chill the burning gases of a back fire and reduce their temperature below that which would ignite vapors of gasoline (from leaky carburetors, tubes and connections), and so reduce the hazard. Cleaners of other than the screen type may also have this property. The essentials are that the individual air passage be very small and the materials capable of absorbing heat readily.

In the following the characteristics of the different types of air cleaners are discussed in a general way.

Characteristics of Air Filters

Plain dry filters, if the filtering material is loosely woven or packed, may stop practically 100 per cent of the dust at first, but may later release that previously caught and pass it on into the engine. If, on the other hand, the material is felted or closely woven, it may continue indefinitely to stop practically all of the dust; but as more and more dust is caught, the restriction may increase to such an extent that loss of power causes the driver to remove the air cleaner. This has often occurred, especially when fog or oily vapors reached the filter. Cement dust seems to have a marked tendency to clog such filters. If the surface area of a felt filter is large for the rate of air flow, and if the spacing leaves sufficient room between parts, the rate of increase of restriction and resulting loss of power will be slow, and the service more satisfactory. Dry felt filters are slightly less efficient when new; they require a small amount of dust to fill up the larger pores in order to develop their full efficiency. Felt made of frowzy material and having only a small proportion of wool is likely to be lumpy and unsatisfactory for air filters. Filters of such material will show lower dust-separation efficiency, and, especially after long use, higher restrictions than good woolen felt.

Filters made of sponge rubber about $\frac{3}{4}$ -in. thick have been used as air cleaners. The efficiency is very high and the restriction not excessive. Two such cleaners used upward of two years on passenger cars in a road test at Davis, Calif., gave excellent protection and showed less rapid deterioration than might have been expected for rubber under such adverse conditions (high temperature and the presence of oily vapors). They were serviced annually by washing and rinsing in water.

If filter elements of felt or cloth must be taken out and dusted or washed in either water or gasoline, holes are likely to be made in the material, particularly if the surface is unprotected (as by a screen). Such filters have been found so full of holes that the efficiency of dust separation, instead of being nearly 100 per cent as at first, was reduced to about 50 per cent. If a dry filter is washed in oily gasoline, the oil remaining tends to increase the restriction more rapidly.

Plain oily filters of organic fibers, not self-washing, if sufficiently thick and of loosely packed material, show efficiencies of well over 90 per cent, and in some models satisfactorily low restriction. If they are washed with gasoline, dried, and reoiled at proper intervals, these

good qualities are maintained. If the cleaner is not serviced, the fibers (or meshes) of the filter become heavily coated with dust, especially along the paths of least resistance through the filter. When all the oil on these fibers has been absorbed the restriction usually does not rise excessively, but the oncoming dust and sand wear off the encrusted dust from the fibers and eventually may polish them clean, leaving small dry tunnels through the filter. Thereafter only the coarsest dust and a small percentage of the fine will be stopped. This type of cleaner is, however, easily serviced, excels in simplicity and small size, and does not greatly interfere with carburetor action even when neglected, unless insects, chaff, or leaves in appreciable quantity get in. A coarse screen over the inlet may obviate this.

If the oily fibrous material is closely packed, the cleaner is likely to maintain high efficiency but have higher and higher restriction as dust is taken in, causing too rich a mixture, unless a balanced-tube carburetor is used. As the restriction increases the filter unit may be forced out of its usual position, leaving passages between it and the walls of the container.

Oily wire screen filters, not self-washing, are usually made of insufficient thickness to stop more than 30 to 50 per cent of the average dust; but, as ordinarily constructed, they offer very little restriction because of their extreme looseness or openness. For this same reason their capacity for holding oil is very small, being somewhat less than that of the loosest of curled-hair filters and about one-twelfth that of pasteboard-type cleaners of the same size. Hence they need washing and reoiling more frequently, except when used on some of the old-model machines in which the space under the hood may be covered with sufficient oil spray to keep the wire screens moist. If not reoiled frequently, this type speedily loses nearly all its power to separate any but the particles that are larger than the meshes of the screen. It should be remembered in this connection that the great bulk of the dust which an air cleaner is called upon to eliminate will pass through a 325-mesh-per-inch screen.

Oily metal ribbon and kinked wire filters, not self-washing, are usually intermediate, as to efficiency, restriction, and frequency of servicing required, between oily curled hair (or other organic fiber) loosely packed and loose oily screens. The thinner and looser the filter the lower the efficiency and the more frequent the need for servicing, but the smaller the restriction effect. Steel-wool usually has characteristics between kinked steel wire and curled hair.

Frequent Cleaning

Oily pasteboard type cleaners vary in efficiency from about 70 to 95 per cent or better, depending principally upon the thinness of the pasteboard and the kind and amount of oil used. If the pasteboard is thinner than about $1/32$ in., accumulating dust may raise the restriction and cleaning may be required oftener than once each 5000 miles. If thicker than about $3/32$ in., the efficiency is materially reduced. This type differs from the oily types previously mentioned in that the pasteboard itself acts as reservoir for several ounces of oil, which oozes out as needed to moisten the dust. An English cleaner using oil-saturated wood chips as the filter material is somewhat similar to the pasteboard type both as to efficiency and mode of operation, but is probably not so easy to clean.

After oily filters, not self-washing, are washed in gasoline or kerosene, they should be *dried thoroughly* before reoiling, or too much of the oil will drain off.

The same thing happens if flushing oil or very diluted old oil is used. Reoiling should be by submerging the filter element; not by sprinkling a few drops from an oil can.

Self-washing oily filters are in use on many modern tractors, on some trucks and buses, and, in cases where dust conditions are severe, as substitute equipment on automobiles. The chief reason for this selection is the possibility of securing high efficiency with constant and not too high restriction and with extraordinary capacity for handling dust. Disadvantages usually present in this type are relatively large size and the need of being placed in the vertical position. Self-washing oily filters, whether of organic fibers, kinked wires, metal strip, or woven or expanded metal screens, and self-washing oily surface cleaners, maintain their original efficiency and restriction practically constant as long as the washing fluid (usually oil) is doing its work. In some makes of cleaners the washing action is very vigorous and effective; in others it is weak and inadequate.

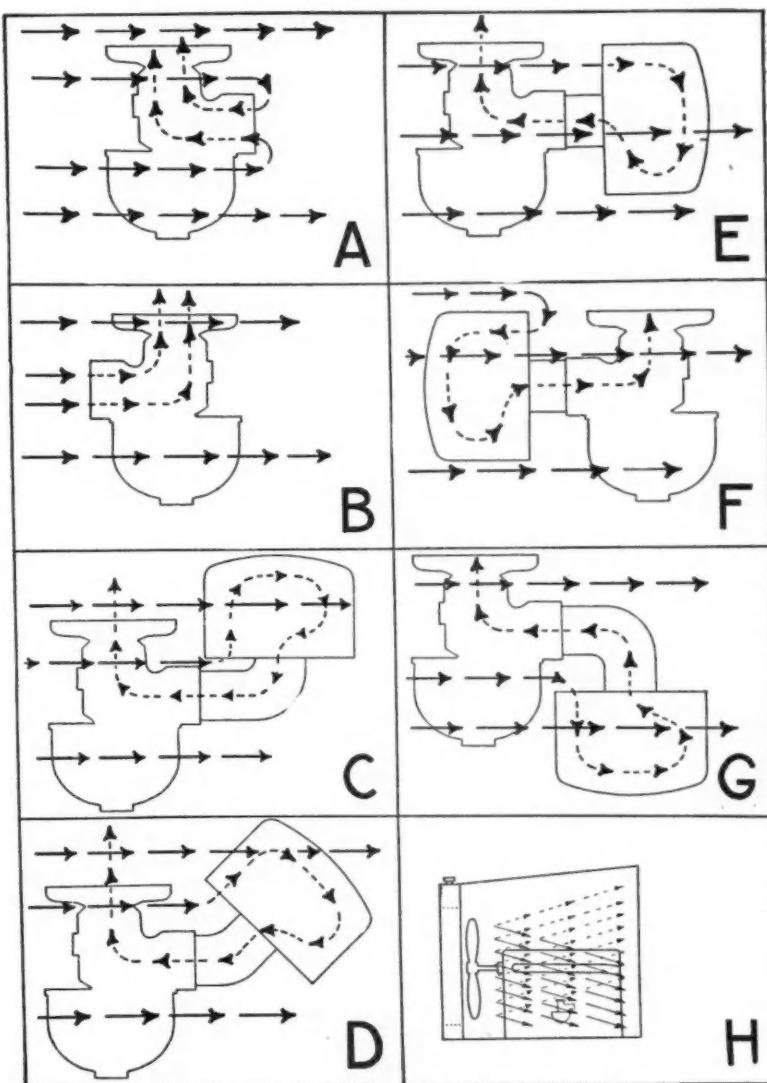
Certain troubles are possible in some cleaners of this type. If the oil must be pumped or otherwise lifted in order to reach and wash the filter, the pumping device may become clogged; or, if there is a moving part, it may wear and become inoperative. If centrifugal action is depended upon to carry up the oil, and if too high viscosity of the oil results from cold or from evaporation of volatile components, the action may cease. Or, if oil of too high original viscosity is used, the lifting action may not take place at all. If, however, too light an oil (kerosene or flushing oil, for example) is used, some may entrain and carry dirt with the air to the carburetor. For most self-washing cleaners there is a rather wide range of viscosity of oil, throughout which washing will take place satisfactorily. In any self-washing oily filter, action will cease when the whole volume of oil in the reservoir is absorbed by the dust caught. Thereafter the cleaner will act much as a plain oily filter, the limitations then being as before mentioned for that type. The length of time the cleaner will serve before all the oil is absorbed depends upon (1) the volume and volatility of the oil, (2) the average rate at which the engine draws air through, (3) the average temperature and dustiness of the air, (4) the position of the air intake, and (5) whether any oil goes over to the carburetor. Since all of these may vary widely, no definite time can be specified. A cleaner of this type has been known to function satisfactorily on an automobile for a year without any servicing. On the other hand, when used under extremely dusty conditions on a tractor, the same type has caught so much dust that it required daily emptying of dirt and dirty oil from the reservoir.

The efficiency of self-washing oily filter cleaners may be as low as 70 or 80 per cent or as high as 97 to 99. If the filter is too loose or too thin, or the material unevenly placed, the efficiency is lower. Manufacturers are often tempted to put

out thin filters because of the low restriction effects. Another factor markedly affecting efficiency is whether much of the dust is disposed of at once in the oil cup or whether all must be caught by the filter proper.

In some self-washing cleaners the oil pumped or otherwise lifted flows by gravity over and down the filter element. In others a crankcase ventilator connection brings vapors of water and of oil and oily spray to the filter to supplement a slow flow of oil from a cistern designed to be filled whenever new oil is added to that in the crankcase. In both these types the rate of oil flow, though sufficient to keep the filter moist, may be so slow as to afford little or no washing action. In some cases of poor design the oil or vapors may moisten only one part instead of the whole filter.

In contrast with the two types just mentioned are the types in which a vigorous spray or splash of oil thoroughly washes down the dirt caught in the filter element. In the first two types the filter element itself might need periodic cleaning; in the last type periodic removal of dirt from the oil reservoir and replenishing of the oil would suffice. Proper size of cleaner for



Various arrangements of the air inlet to the carburetor both with and without an air cleaner + + + +

the given engine is important for this type. Dust sometimes collects on the inside surfaces of the air inlet tubes of certain self-washing oily filter type cleaners and may clog the passage unless it is cleaned out periodically. This is due to the tendency of oil to creep over metal surfaces. Some plain oily filters, not self-washing, may be affected similarly.

The fibers, if loosely packed, may wear and break after long use because of vibration or may rearrange themselves so as to leave relatively large passages through which the air may pass uncleansed. In some cases, the oil itself may possibly cause or hasten disintegration of the fibers. Loose pieces from a disintegrating filter may clog carburetor passages. For similar reasons steel-wool may cause trouble if substituted for kinked hard-drawn steel wire or for copper ribbon. Professor Hoffman states that such troubles concerning the last two materials mentioned have never been brought to his attention, except where the materials were too loosely packed; but corrosion troubles have been reported in cases where the dissimilar metals chosen for filter and container have set up electrolytic action when moisture was present.

Oily Metal-Plate Type Are Rugged

Oily metal-plate type cleaners are capable of very rugged construction and are not adversely affected by extremes of air temperature. They are usually similar to the oily screen type as to efficiency, but as a rule show somewhat higher, though constant, restriction. In some cases they are made self-washing by rotating circular plates with the lower segments dipping in oil.

This type may be made of the required efficiency by using a sufficient number of plates or by adding wire screens between adjacent plates. In one make of this type the plates are formed to a certain curvature so that inertia (centrifugal) effects aid in bringing the dust particles into contact with the oily surfaces, especially at high air speeds. When the metal plates are rotated at very slow speeds the washing is usually satisfactory and no oil entrains, but if the rotation is too rapid, drops of dirty oil are liable to go over to the carburetor.

A cleaner of somewhat similar type consists of a helicoid of metal fixed in a tube through which the air is made to pass. A tube coming from the crankcase acts as a ventilator and brings vapors of oil and of water to moisten the surfaces of the cleaner. Unless adequate provision is made to prevent it, the condensed oil and water vapors will flow along the inside surfaces of cleaners of this type, carrying the dirt along into the carburetor.

Modification of Oily Plate Type

Another modification of the oily metal-plate type is in use in Germany and elsewhere in Europe. The dusty air is made to pass through a filter consisting of a mass of oily thimbles (made by cutting off short pieces of metal tubing). The efficiency is good if sufficient depth of filter is used and the thimbles are frequently washed and reoiled. The restriction is not excessive if the proper area of filter is chosen, but the device is bulky.

Inertia-type cleaners (almost all of which are dry centrifugal) are as a rule unable to handle satisfactorily anything except the coarser dust particles. Designers sometimes raise the efficiency by restricting the area of the inlet passages where the whirling motion is imparted; but when this is done the restriction is in-

creased and may become prohibitively high at high car speeds. Further, at low speeds and consequent slow flow of air through the cleaner, the power to separate the dust particles is almost entirely lost. Experience has shown repeatedly that cleaners of this type do not furnish adequate protection under severe dust conditions. A new 1928 six-cylinder automobile in use by the California Highway Commission between Oroville and a road construction camp about 16 miles out had run only 3478 miles when the engine was found so badly worn that the cylinders had to be rebored and 0.015-in. oversize pistons put in. The air cleaner supplied as regular equipment on this machine was a dry centrifugal without rotor and without dust ejector slots. The expectation of the designer of the cleaner evidently was that the separated dust would fall out by gravity through the same openings by which the dusty air entered. After each hundred miles of use of the machine in question it was found necessary to take apart the carburetor and its connections and remove the accumulated dirt. One such cleaning-out yielded 99.48 grams (3½ oz.) net dry. This does not represent the whole amount of dust that entered the cleaner during the 100 miles, but only the portion that passed through the cleaner and stopped in the carburetor and connections instead of going on into the engine. A self-washing oily filter type cleaner was substituted and no further trouble was reported in the year following.

Centrifugal Cleaners Offer Restriction

Contrary to common opinion, dry centrifugal-type cleaners offer very considerable restriction especially at high car speeds. The length of time since the last servicing will, however, usually have little effect on the restriction. Though cleaners of this type do not require very frequent servicing, they do need occasional attention to maintain even their low efficiency. If there are dust-outlet slots, they may become clogged with oily dirt, the bodies of insects, or bits of chaff or leaves. The vanes may become heavily coated with dirt and become less effective. The moving parts, if any, may become worn or loaded down with accumulations of dust and oily vapors so that their action may be impaired or cease entirely. If gas from the exhaust manifold is used to eject the separated dust, carbon will accumulate in the venturi throat, upon the action of which the functioning of such ejectors depends. If, however, an engine is in good condition and adjustment, with little carbon in the exhaust, the throat of such a cleaner should not require cleaning out oftener than once in four to six months of normal operation.

The air leaving a dry centrifugal cleaner may still have considerable whirling motion when it enters the carburetor. This may interfere with carburetor action in some machines at certain engine speeds. Usually cleaners of this type have a device for straightening the air flow.

Inertia-type cleaners using the blast from the radiator fan as an auxiliary are found to have the limitations common to the inertia type and in addition are handicapped in that they must necessarily be placed where the dust concentration is greater than at some other places under the same hood. Their small servicing requirements and simplicity gave them some popularity a few years ago, but they have now practically disappeared.

Water-type cleaners are still used on a few tractors, but are in general too heavy and bulky for use on road vehicles. They have become unpopular even for trac-

tors, chiefly on account of (1) the large amount of care and attention required; (2) the tendency, especially of some constructions, to get out of order; (3) the danger of freezing; and (4) the danger, under certain circumstances, of water going over into the carburetor. Some makes have given excellent service on tractors. These good records result from extra-large water capacity, robust construction of interior parts, adequate provision against clogging by chaff, leaves, and insects, and care in placing the air intake so as to avoid the bulk of the dust. Some recent work reported by the United States Bureau of Standards shows that moistening the air entering the carburetor reduces detonation (knocking) and makes for smoother running, but may reduce power by as much as 8 or 9 per cent in extreme cases.

Combinations of several types in one cleaner are often attempted, and sometimes two cleaners are used in series. Generally in such cases an inertia type is placed ahead of a filter, with the idea of lessening the work of the latter and so increasing the time between servicings. Placing two cleaners in series on an automobile engine is in the main unsatisfactory, because the combined restriction of the cleaners and their tubular connections is too high and because the cost and space requirement are larger. The use of more than one principle of dust separation is, however, found in several of the most satisfactory cleaners.

Position of Air Intake

Tests have shown that not all possible positions for the air intake to the carburetors of automobiles, trucks and tractors are equally dusty. In one case the time between servicings of the air cleaner on a certain small tractor was increased from one day to ten days by simply taking in the air through a standpipe extending 2 ft. above the regular low intake position. Long tubular connections or "periscopes," used for drawing cleaner air from higher levels, are undesirable on automobiles and trucks because the inertia of the long air column tends to make the engine sluggish when the throttle is opened suddenly. Also the added restriction is more detrimental where wide variations in speeds and engine load are the rule, as in road vehicles. High intake pipes are found on a number of late-model tractors. Their use increases the effectiveness of the air cleaning equipment and is unobjectionable except in orchard work and the like (where headroom is limited). Flexible metal tubes are notoriously leaky unless kept well taped and shellacked. Air leaks between air cleaner and carburetor may admit much dust. They should be closed by the use of friction tape securely fastened.

The direction of the air inlet with reference to the direction of the fan blast is also of considerable importance. This is shown by a three-year test made of the dust caught by a self-washing oily filter-type cleaner on a Dodge touring car. During one year the air inlet faced the blast from the radiator fan; during the next two years it faced in the reverse direction. The dust caught per mile of travel during the first year averaged 3.5 times as much as that during the next two years.

Fig. 1 illustrates various possibilities of carburetor and air-cleaner inlet placing and shows why different amounts of dust are taken in. If no air cleaner is to be used, arrangement A is preferable to B. If an ordinary dry centrifugal cleaner with ejector slots and without rotor is used, it should usually be placed as in F. If the cleaner is placed as in E it becomes

in effect a dust scoop, and more dust may enter the carburetor than would if the cleaner were left off. This arrangement is found in one late model car. Arrangement D is probably little if any better than E. Whether C or G is preferable depends upon what side of the engine the air inlet is located. Usually G is to be avoided. As indicated in H, the radiator fan throws the air stream somewhat upward on the side of the machine on which the fan blades rise and downward on the side on which the fan blades descend. If the air inlet is located on the descending side, arrangement C may be preferable to arrangement F. It should be remembered also in this connection that objects in the air stream (starting motor, spark coil, etc.) act as dust shields for the spaces directly back of them.

Cleaners without protecting shell also are considerably affected by their position relative to the fan blast. The blast striking an unprotected side of one of these cleaners quickly removes the oil from the filter material on that side and drives in the dust. This results in lower efficiency and earlier need for servicing. When such cleaners are placed in a horizontal position, the end plate usually serves as a protecting screen. If they must be placed in a vertical position it is advantageous to use a cylindrical or semi-cylindrical shield.

When the fan is shrouded or when it is located very close to the radiator core and there are louvers in the hood, that portion of the space under the hood above a line drawn from the topmost point of the shroud and the rear end of the hood center line (hinge) is most nearly free from dust. The dust usually is thickest at the location of the carburetor, in spite of which air cleaners are generally direct-connected to the carburetor, as it is desired to avoid long tubular connections. In some engines, particularly those of V-type, it is feasible to draw the air from the clearest area just back of the upper portion of the radiator. Because the air required by the carburetor is only a small fraction of that drawn in through the radiator by the fan, the presence of the carburetor air inlet at any given place under the hood does not greatly affect the dust distribution.

Bulletin 499 of the Agricultural Experiment Station, University of California, Berkeley, Calif., contains specifications, illustrations, and test data of practically all of the air cleaners on the market, as well as a summary of the results obtained in the tests.

Kellett Autogiro K-2

(Continued from page 201)

equipped with a long-travel oleo strut, so that when "tail-first" landings are made, there is no tendency for the tail to bounce, and landing shocks are taken up before reaching the fuselage.

The vertical fin, rudder, elevator and stabilizer are all of thick-section streamline form, and the horizontal surfaces are of high aspect ratio. It will be noted that the stabilizer area is relatively small, which is permissible because the rotor system in an autogiro serves to a very great extent as a stabilizer in all directions. This is due to the fact that the autogiro has very high inherent stability which actually increases as the forward speed decreases. The fixed stabilizer is more important because of its effect in increasing the efficiency of the elevators as control surfaces than The fuselage frame of the Kellett K-2 is built entirely as a mere stabilizing surface.

The FORUM

Some of the most stimulating automotive engineering discussions ever held have first appeared in print in The Forum. It's your space, engineers and executives, for the discussion of your own ideas. We reserve only the right to edit. The more challenging your letter, the more chance it has for publication. Brief letters are desirable, but excellence will usually merit space

Minnesota Tests Confirm Sparrow on Oil and Bearing Temperatures

Editor, Automotive Industries:

In "Why Oil Coolers for Engines?" in the June 13th issue of *Automotive Industries*, S. W. Sparrow of Studebaker Corp. states that bearing temperatures result from the shearing of the oil film in the bearings. Experiments carried out at the University of Minnesota by Corbett and Lowe, students in Internal Combustion Engines, corroborate Mr. Sparrow's statement.

A four-cylinder engine was directly connected to an electric motor and driven at a constant speed of 700

r.p.m. There were 5 main bearings, $2\frac{1}{2}$ by $2\frac{1}{8}$ in., with force feed lubrication; connecting rod bearings, $2\frac{1}{2}$ by $1\frac{13}{16}$ in. Thermocouples were embedded in the connecting rod bearing of No. 4 cylinder and also in the fourth main bearing. Oil was fed by the pump to the center main bearing for distribution to the other main bearings and the connecting rods. The cylinder head and crankcase were removed and the oil supplied from a constant temperature tank which was weighed to determine the rate of oil

feed. The oil was not recirculated. Tests were started with the engine always at room temperature.

Curves in Fig. 1 show the temperature rise of the two bearings, using a medium oil (225 seconds Saybolt at 130 deg. Fahr.) which was supplied at room temperature, 77 deg. Fahr. Those in Fig. 2 show the bearing temperatures when using the same oil with the supply maintained at 50 deg. Fahr. Fig. 3 shows the temperature rise when using the oil diluted with kerosene to obtain a viscosity of 190 seconds Saybolt at 130 deg. Fahr.

No attempt was made to regulate the quantity of oil supplied to the bearings. The pump supplied with the engines was operated in the normal manner. Consequently, there was a large variation in the quantity of oil supplied. When using the diluted oil, 0.79 lb. per minute was supplied to the entire engine and the temperature of the two bearings rose simultaneously to 132 deg. Fahr. When using the medium oil at 77 deg. Fahr., 0.55 lb. per minute was supplied, and the temperatures of the two bearings rose together for about 6 minutes, when the temperature of the connecting rod bearing rose above that of the main bearing. The final tempera-

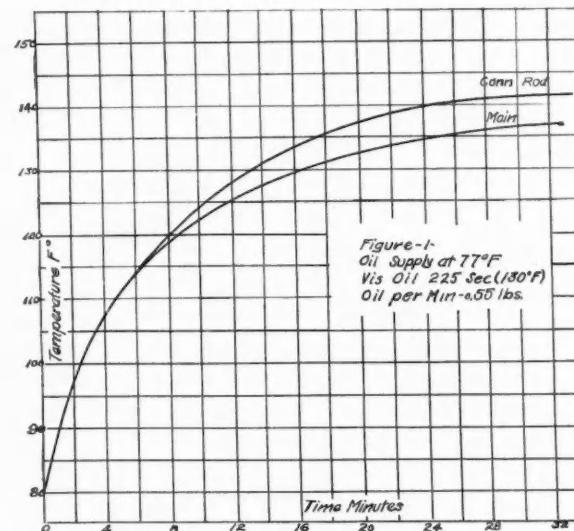
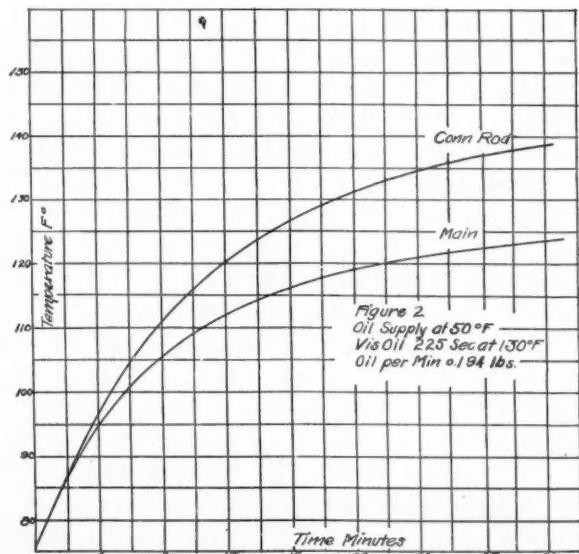


Fig. 1—Shows the temperature rise of the two bearings using medium oil + + +

Fig. 2—Shows the bearing temperatures using the same oil with supply maintained at 50 deg. Fahr. + + + + +



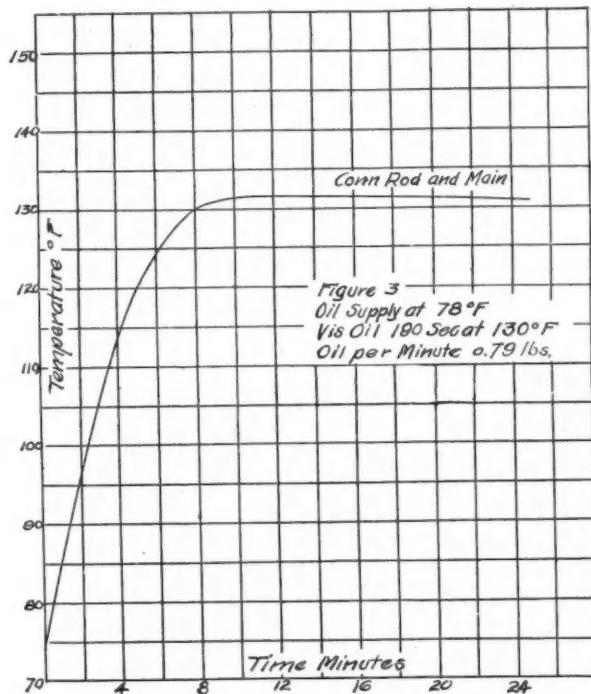


Fig. 3—Shows the temperature rise when the oil was diluted to obtain a viscosity of 190 second Saybolt at 130 deg. Fahr. ++

tures reached were 140 deg. and 135 deg. respectively. When medium oil was supplied at 50 deg., only 0.195 lb. was used per minute, and the connecting rod bearing rose at a more rapid rate from the start, attaining a final temperature of 140 deg., while the main bearing did not rise above 125 deg.

In the above experiments, the temperatures reached were entirely the result of oil shear in the main and connecting rod bearings. When the rate of oil flow decreased on account of cooler oil, or oil of increased viscosity, the temperature difference between the main bearing and the connecting rod bearing increased, due to the heat supplied to the oil by the crankshaft between the two bearings. Evidently any advantage in supplying oil at 50 deg. instead of 77 deg. was largely offset by this heat trans-

mission, insofar as the connecting rod bearing was concerned.

As might be expected, the diluted oil produced lower bearing temperatures. Less internal friction in the oil and a larger supply volume both tend to reduce the temperature. When operating the engine with the crankcase in place and recirculating the oil, the temperatures of the two bearings were the same. Five times as much oil circulated through the engine bearings with the supply at 160 deg. as at 77 deg.

It would appear that the oil supply should not be overcooled, but that it would be advantageous to keep the temperature of the oil up where the circulation would be rapid enough to produce uniform bearing temperatures for the connecting rods and the main bearings.

B. J. ROBERTSON.

Into the Truck-Rating Question Enter Speed and Road Conditions

Editor, Automotive Industries:

"Is the answer to the truck rating problem no specific load rating at all? The real test of whether a truck is overloaded or not, is not how many pounds it may be carrying, but the stresses set up in the various parts of the vehicles. If the stresses set up in

any part are in excess of the designed capacity of that part, then that part is overloaded regardless of the load on the truck.

"Load is only one of the factors creating stresses in the parts. The others are speed and the characteristics of the highway on which the vehicle is operated. Now, if a load rating is assigned to the truck, to what speed and highway conditions does it apply? If the load rating assigned contemplates operation at relatively high speed over poor highways, then obviously an exactly similar truck which is operated on smooth highways will be underloaded if it is accepted that the real measure of overloading is the stress set up in the individual parts. If the owner who operates on smooth highways carries the same load as the one who operates under the most severe conditions, isn't he penalizing himself?

"Inasmuch as load is only one of three factors determining overloading, is it possible to rate trucks rationally on that basis alone? And, because both speed and highway characteristics vary so widely, is it possible to develop any standard scheme of rating including all three factors?

"Perhaps instead of using load or gross weight ratings it would be better for the manufacturer simply to distinguish his different models by a letter or number and for each model provide a range of allowable loads for different operating conditions. For example, Model A might be given a load allowance of 6000 lb. over smooth city streets but only 4000 lbs. on rough roads, and perhaps less than that in dump truck service. Both the selling organization and the operator could be informed of these load specifications, and advised that the factory would stand responsible for the vehicle only if operated in accordance with these specifications.

"This plan at least would provide a rational basis for the selling organization to work on, as it would take into account ALL of the factors affecting the load-carrying ability of the truck. It may be argued that this method is too complicated for the salesman. For some salesmen undoubtedly it would be, and those salesmen probably will continue to sell trucks without any consideration of the operating conditions regardless of what rating standard is adopted. For those salesmen who try to sell a vehicle that fits the job, this suggested plan would provide them with information that would make their work very much easier.

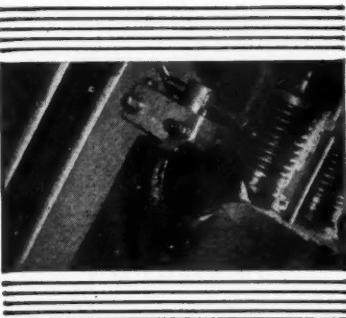
"Of course, no rating plan is going to prevent overloading, for the reason that when the pressure of competition becomes severe some selling organizations are going to continue to specify trucks that are too small for the job in order to quote a competitive price. But rating trucks on the basis of carrying capacity without giving consideration to speed and highway characteristics is about as logical as it would be to guarantee that a lathe would remove so many cubic inches of material per minute without specifying whether the material was cheese or high manganese steel."

This communication was received from a reader who does not wish his name printed and opens up another interesting angle of truck rating.

Automotive Oddities—By Pete Keenan



Correspondence about "Automotive Oddities" is invited. Contributions used will receive editorial mention when practicable. If you are interested in the source of, or the reason for, a particular "Oddity," ask the editorial department of Automotive Industries about it.



NEWS OF THE INDUSTRY



July Production Put at 221,485

N.A.C.C. Estimate Indicates 14 Per Cent Decline

NEW YORK, Aug. 5 — Motor vehicle production during July totaled 221,485 vehicles according to preliminary estimates prepared by the National Automobile Chamber of Commerce. This represents a decrease of 14 per cent under June of this year, and 20 per cent under July of last year.

Production for the first seven months is 1,855,933 or 28 per cent under the seven months' production last year.

Adopts Warranty

DETROIT, Aug. 6—A new owner's service policy for purchasers of Hudson and Essex automobiles under a warranty clause in the sales contract is now effective.

Owners will be enabled to obtain adjustments under the warranty free of charge from any Hudson-Essex dealer.

The policy provides that for 90 days after delivery or for 4000 miles of driving, whichever shall come first, any parts (tires excepted) which shall have proved defective in either material or workmanship will be repaired or replaced without charge to the owner for the parts or the labor.

In addition, the owner will receive from the distributor or dealer selling the car a lubrication and mechanical inspection at the expiration of 500 miles of driving and again at the expiration of 1500 miles of driving at no charge other than for oil, grease or supplies used.

July Registrations Lag

PHILADELPHIA, Aug. 6—July registrations of new passenger cars were 18 per cent behind the same month last year in the first three states to report—Illinois, North Dakota and South Carolina.

THREE is, of course, a man behind the interesting story of production of a truck in China, which appears on page 199 of this week's issue. D. F. Myers is chief engineer in charge of the work. The following details about his previous career are condensed from information furnished by Miss Ursula Delchamps, sessions secretary of the S. A. E., of which Mr. Myers has been a rather active member: Mr. Myers was born June 17, 1889, at Vincennes, Ind. His education was got from books and practical work, as the record of his company affiliations tends to show. From 1916 to 1919 he was inspector and assistant chief inspector for the Service Motor Truck Co., of Wabash, Ind. For a short period he served as chief inspector for the Traffic Truck Corp. in St. Louis. Then came an engineering affiliation with the service organization and its successor, Service Motors, Inc. During the period 1919-1928 Mr. Myers went up the usual ladder from draftsman to chief engineer. For a year after that he served as field engineer for Relay Motors Corp., Lima, Ind. Followed, a year in Los Angeles and then the appointment as chief engineer, automotive section, industrial works (trench mortar arsenal), Mukden, Liao Ning, China. Mr. Myers' specialty, as you may have gathered from the foregoing, is truck design. His membership in the S. A. E. dates from 1925. In 1926-27-28 he was a member of the motor truck division of the Standards Committee, serving as vice chairman of the division in 1928. During the above three years he also served on the transmission division of the Standards Committee. Now you have the background on why so much emphasis is laid on the use of S. A. E. standards in the truck which Mr. Myers has designed and produced for the Chinese government * * * the Duco Color Index for July shows quite a decline in the popularity of black to the advantage of the blue family . . . isn't it natural that blue should be popular at this time? Or perhaps it indicates a slight improvement over black in the business situation * * * Passage aboard the Graf Zeppelin from Germany to Brazil for the two flights to be made this month and next will be sold in America by the Hamburg American line at the reduced rate of \$750 if passengers also book for the ocean voyage from this country to Europe on one of the steamers of this company. This rate is a 25 per cent reduction from the regular rate of \$1,000 for this trip. The first trip on the Zeppelin will start Aug. 26 and the second on Sept. 19. * * * Courtney Johnson has resigned as sales manager of the Hudson Motor Car Co. William R. Tracy will assume larger responsibilities in connection with sales, it is believed, with the title of sales manager. Chester G. Abbott, whose title is general sales manager, made the announcement.—H. H.

General Motors Corp. Declares 2 Dividends

Both Common and Preferred Will Be Paid

NEW YORK, Aug. 5—General Motors Corp. has declared its regular quarterly dividend of 75 cents a share on common stock, payable Sept. 12 to stockholders of record Aug. 15. The corporation also declared its regular quarterly dividend on preferred stock of \$1.25, payable Nov. 2 to stockholders of record Oct. 5.

Rolls Seeks Change

SPRINGFIELD, MASS., Aug. 6—A plan that stockholders of Rolls-Royce of America, Inc., were recently asked to approve is regarded as a move toward the production for American use of a single model of Rolls-Royce chassis, the principal working parts of which would be made in Derby, Eng., leaving numerous other parts to be made in the Springfield plant, which would assemble the chassis and also continue to supply the bodies.

For the time being the American company is seeking a reduction of the quota of five English cars a week which the company is bound to accept under the existing contract.

Nash Offers Free Wheeling

KENOSHA, WIS., Aug. 18—The Nash Motors Co. announces that hereafter any model of its four new series cars may be had with free wheeling at slight extra cost. When applied, the free-wheeling device fitted operates in all three forward speeds. It is controlled by a small shift lever extending up from the floor at the right side of the driver and can be applied or disengaged at the will of the driver. These cars are regularly equipped with a synchro-shift transmission.

THE
NEWS
TRAILER

Junking Plan Policy Changed

Cleveland Arrangement Will Now Include Sale of Salvaged Car Parts

CLEVELAND, Aug. 3—The Cleveland Guarantee Auto Scrapping Co., will enter the used-parts business as the result of a new agreement made by the company with the Cleveland Automobile Manufacturers & Dealers Association and a committee representing the car factories. This company, which was organized by independent capital something over a year ago to cooperate with local dealers in disposing of junkers, heretofore has operated on a 100 per cent scrap basis.

The change in policy has been approved by the factories, which have been accepting the company's "certificate of demolition" for payment of junking rebates, in place of personal demolition by factory representatives. Originally when the factories agreed to accept the company's certificate, bond was given that no parts would be sold. This feature of the agreement has now been waived by a committee of the National Automobile Chamber of Commerce and the scrapping company will give a new bond guaranteeing only that no complete cars or chassis will be sold.

In explanation of the change in policy, the announcement of the Cleveland association says: "Operation over more than a year showed that the refusal to sell parts did not affect the supply of used parts inasmuch as it requires only about 27 per cent of the total number of cars scrapped to supply the used parts market. The principal effect therefore was to tie the hands of the approved yards so far as the sale of parts and the purchase of cars were concerned."

It is understood that the Buffalo yard, which operates along somewhat the same line as the Cleveland yard, also will enter the used parts business.

Gardner Files Inventory

ST. LOUIS, Aug. 3—An inventory filed in Circuit Court July 31 by Russell E. Gardner, Jr., as receiver for the Gardner Motor Co., values the company's holdings at \$601,839. The company quit making automobiles last March, and subsequently was placed in receivership.

The inventory includes the following items: Cash, \$180,090; the factory buildings at Main and Rutger Streets, \$100,000; 200 shares of stock of the Rutger Street Warehouse, Inc., \$151,000; 30,000 shares of Detroit Aircraft Corp. stock, \$45,000; machinery and equipment, \$10,312; materials and supplies, \$9,711; a trustee's account on Cleveland, Ohio, real estate, \$86,112;

accounts receivable, \$15,864. The Gardner Company, which began as a buggy factory nearly 50 years ago, manufactured the early Chevrolet automobile, which was sold to General Motors in 1918. Until last spring the concern made an eight-cylinder car, but found competition from the large automobile concerns too keen.

Plymouth Leads in Wayne

DETROIT, Aug. 5—Wayne county registrations during July totaled 4440, a decrease of 1563 or 22 per cent from 6003 in June and a decrease of 1486 from a total of 5926 in July of last year. Total registrations to date this year are 34,912, against 50,048 for same period, 1930. Plymouth registered 1249 cars during July, an 84 per cent increase over June figure and 89 per cent over July, 1930, figure. Ford registrations were 1063, a decrease of 74 per cent from total of 4159 for July, last year. Chevrolet registrations were 850, a decrease of 44 per cent from the figure for June and 38 per cent for July, 1930, figure. Oldsmobile was fourth with 138, Chrysler fifth with 135 and Buick sixth with 122. Commercial car registrations during July were 266, against 508 for June and 413 for July last year. Ford was first with 149, Chevrolet second with 45 and G.M.C. third with 27.

Libbey Reports Profit

TOLEDO, Aug. 3—Profit of \$15,980 in the June quarter was reported by Libbey-Owens-Ford Glass Co., reducing the loss for the first half year to \$162,091, it was reported by J. D. Biggers, president. Results under new General Motors contract will be reflected in third quarter, as deal was effective July 1. Sharp decline in automotive requirements in June produced a loss that month following profitable operations from March through May.

Graham Reports Loss

Graham-Paige Motor Corp. and subsidiaries for the first six months of this year report net loss of \$833,056. This compares with loss for the first six months of last year of \$880,960. Loss for the June quarter was \$654,533, as compared with \$391,480 for the corresponding quarter of last year.

The balance sheet as of June 30 shows current assets of \$9,095,931 and current liabilities of \$2,895,643.

Graham Body Plant Closes

EVANSVILLE, IND., Aug. 3—The local plant of the Graham-Paige Body Corp., builders of Graham bodies, shut down Saturday for a period of two weeks for inventory taking, J. W. Evans, factory manager, reported. The industry has been employing 150 men.

Steel Markets Await Activity

Dearth of Orders Prevents Real Test of Price Increases

NEW YORK, Aug. 6—What business from automotive consumers comes to steel mills is of retail proportions, but there is general expectancy of the market turning more active before the end of the month. Not only must motor car manufacturers and parts makers provide for fresh supplies of finished steel before resuming more normal production schedules, material on hand being virtually nil, but in many instances even tool and die departments are bare of steel. Insufficient business has so far prevented a test of recently advanced prices on sheets and strip. The market for semi-finished material is rather flabby.

The nominal quotation for sheet bars continues at \$29, Pittsburgh or Cleveland, but there are reports of sales at \$1 below that level. Steel bars are easy at 1.60c., Pittsburgh, with cold-finished bars nominally held at 2.10c., but moving only in very small lots. Demand for automotive alloy steels is very light.

With conditions as they are, the rate of operations at primary as well as finishing mills seesaws from week to week, if not from day to day, and estimates of the rate at which the steel industry as a whole is operating are frequently misleading.

The capacity of the steel industry which in all of these estimates forms the basis of computation is strictly a theoretical affair and is at least 10 per cent higher than what may be assumed as representing an actual maximum of production. When proper allowance is made for this discrepancy, the picture presented by these estimates is not nearly so disheartening. And even then much of what is included in capacity consists of equipment that has become obsolete in point of cost of the product.

Pig Iron—Small lots, as needed by automotive foundries, constitute what business there is, all contracting being in abeyance. The Michigan price continues at \$17.50, with the Ohio market at \$17, furnace, in the Cleveland District, and at \$16@\$17 at other points.

Aluminum—Quotations are unchanged, with demand for secondary metal from automotive foundries reported rather fair for August.

Copper—With offerings by some first hands at 7½ cents, delivered Connecticut Valley, early this week, the copper market registered new lows. Some of the custom smelters quoted 7½ cents, and the "official" price on Monday was still 8 cents. With some of the South African mines reported to be operating at a profit even at prevailing low prices, rumors of a complete stoppage of production find little credence.

Tin—Formation of a new tin pool, participated in by Dutch, Straits and Bolivian producers, is proposed. London was closed on Monday, which was a bank holiday. The week's opening price for Straits was 24½ cents.

Lead—Quiet and steady.

Zinc—Dull and easy.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, Aug. 5—General business last week was strongly in the grip of the mid-summer dullness. The very high temperatures throughout most of the country had a deterrent effect on trade, and the retail business level was slightly lower than in the few weeks preceding. Wholesale and jobbing lines were very slow and just about managed to hold their own. It has been reported that some fall business is being done, although on a very limited scale. Financial news from Germany has been a bit more cheerful, and stock markets in London and Paris acted very well last week.

RAILWAY BUSINESS

Railway business continued to decline during the week ended July 18. Railway freight loadings during that week totaled 757,555 cars, which marks a decrease of 6,026 cars below those during the preceding week, a decrease of 170,716 cars below those a year ago, and a decrease of 322,413 below those two years ago.

Net operating income of Class I railroads during the first six months of this year totaled approximately \$239,000,000, which marks a decline of 36.5 per cent below that in the corresponding period last year.

COMMERCIAL FAILURES

Commercial failures during July, according to R. G. Dun & Co., numbered 1983, as against 2028 during the record July last year. Liabilities involved in the July failures amounted to \$60,997,853, as against \$39,826,417 a year ago.

COAL PRODUCTION

Bituminous coal production during the week ended July 18 amounted to 6,794,000 tons, as against 6,671,000 tons during the preceding week and 7,922,000 tons a year ago. Production of anthracite amounted to 751,000 tons, as against 775,000 tons during the preceding week and 1,299,000 tons a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended Aug. 1 stood at 69.3, as against 69.5 the week before and 69.8 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended July 29 were 23 per cent below those a year ago.

STOCK MARKET

The stock market last week experienced another setback. Mostly the decline is attributed to the announcement of the United States Steel Corporation that its annual dividend rate will be cut from seven to four dollars. The volume of trading increased. Most issues suffered net losses for the week.

BROKERS' LOANS

Brokers' loans in New York City during the week ended July 29 decreased \$26,000,000, bringing the total of these loans down to \$1,390,000,000, which marks the lowest level since 1924.

RESERVE STATEMENT

There was very little change shown in the consolidated statement of the Federal Reserve banks for the week ended July 29. Holdings of discounted bills increased \$1,000,000, while holdings of bills bought in the open market and Government securities remained practically unchanged. The reserve ratio on July 29 stood at 84.3 per cent, as against 84.3 per cent a week earlier and 84.1 per cent two weeks earlier.

Automotive Retail Business Second in Bulk, Survey Indicates

WASHINGTON, Aug. 3—There are 1,550,000 retail establishments of all kinds in this country, and perhaps the most surprising disclosure of the retail census is the importance the automobile has in creating opportunities for enterprises.

This was one of the striking points brought by Dr. Julius Klein, Assistant Secretary of Commerce, in a recently broadcast address on "Surveying Business."

"There are 253,300 sales establishments, filling stations and garages in this country which minister to the automobile and its operations, and their annual combined business amounts to \$9,546,000,000, only exceeded by the national outlay on food," Dr. Klein declared. "The places selling automobiles provide \$6,300,000,000 of this business and the 124,000 filling stations add nearly \$2,000,000 more."

These are some of the details of the American business picture as it is now possible to construct it in view of the near-completion of the retail distribution census, the first ever taken. Dr. Klein explained that prior to recent years the great mass of business decisions resulted from the instinctive guessing of successful men, and from the rule-of-thumb traditions in each industry, being always under the sway of impressions spread by speculative performances in security and commodity markets.

It was declared that better knowledge as to all phases of the intricate operation of industry, wider distribution of facts, and institution of effective research into economic factors will make for business stability.

"We are obviously coming out of the depression now; and at the same time we are seeking the basis laid for an enduring, stable prosperity that will resist another unbalance," he de-

clared. "Of course, all business doubts and difficulties will never be settled by the simple process of setting up and circulating figures. The need for careful, intelligent interpretation of these business indicators, for their comparison in every direction, will always be with the business man."

Dr. Klein said that the railroad car-loading barometer has shown a serious and maintained drop and if this business indicator were to be accepted alone, it would be necessary to conclude that during the depth of the depression last spring the general business of the country had declined more than 35 per cent from customary levels.

"Yet, serious as was our business decline, we can be pretty sure that we never went so far down as the reading of railroad traffic indicated. What has been going on is one of those shifts. New forms and types of transportation have been taking traffic away from the railroads, we find, rather than that traffic has been disappearing. Motors on the highways, pipe lines under the earth for gas and oil, electric transmission circuits striding high on those steel towers, delivering energy to places which once consumed fuel—all play a part in the development. One inquiry that has been made indicates that there are now more than 600,000 motor trucks operating for hire in the United States.

"Assuming the average annual gross earnings of these trucks to be \$4,000, the freight bill for truck movement in the United States amounts to over \$2,000,000,000 a year. Compare that with the gross freight earnings of railroads last year—about \$4,000,000,000—and you can see why we are rather sure that the picture is one of traffic diversion rather than traffic destruction in this country when rail freights fall so sharply."

M. & E. A. Resolution Approved

NEW YORK, Aug. 3—Motor and Equipment Association has approved the resolution covering recognition of shop equipment clinics, suggested by the dual Shop Equipment Committee of that association and the N.S.P.A.

This resolution was quoted in last week's *Automotive Industries* and with approval by the M.E.A. now becomes operative.

Growers Fail to Agree

NEW YORK, Aug. 3—No possible agreement with regard to a plan for the restriction of rubber growing was found by the special committee appointed by the Dutch Colonial Minister to start this proposition. Some of the members of this commit-

tee favor permitting the economic laws to take their natural course, while others maintain that governments of the various producing countries must give assistance to the industry.

Motor Securities Decline

NEW YORK, Aug. 3—Capital securities of seven automotive companies showed a decrease in stock market valuation of 1.2 per cent during July, being the smallest decline shown in any of the 13 groups used for comparison, according to Frazier Jelke & Co.

Motor securities decreased in value \$24,193,000. The 100 securities shown in the 13 groups showed a decrease of \$1,555,559,000 or 7.8 per cent during the month. The largest decline was in steels which dropped 17.4 per cent.

Men of the Industry and What They Are Doing

Names Machine Committee

A committee on machine design has been appointed by F. C. Spencer, chairman of the Machine Shop Practice Division, American Society of Mechanical Engineers. This committee will arrange for papers on machine design to be presented at meetings of the society and will, in general, coordinate the activities of members interested in this phase of engineering and manufacturing. Those appointed are: Frank L. Eidmann, chairman, professor of mechanical engineering, Columbia University; Joseph B. Armitage, chief engineer, Kearney & Trecker Corp.; G. H. Ashman, engineer, General Electric Co.; George F. Cosgrove, president, Cosgrove Technical Service; George F. Nordenholz, associate editor, Product Engineering; Frederick Franz, consulting engineer, and Albert Palmer, assistant to general manager, Crompton & Knowles Loom Works.

Davis Returns to U.S.

Paul R. Davis, manager of the truck division of Studebaker Pierce-Arrow Export Corp., returned to the corporation's home office in South Bend, Ind., last week from a five months' European trip. During his stay in Europe, Mr. Davis worked with Studebaker dealers in England, France, Holland, Belgium, Germany, Finland, Denmark, Sweden and Norway in a sales promotional capacity.

Studebaker Names Deleon

George Deleon has joined the overseas personnel of the Studebaker Pierce-Arrow Export Corp. as a traveling representative, his first assignment being in Caracas, Venezuela. He formerly served the corporation as a traveling representative in Mexico and Central America.

Commercial Elects Kepper

Commercial Credit Co. has elected James H. Kepper, vice-president of the Hibernia Bank and Trust Co., New Orleans, as a director. Mr. Kepper has been vice-president and director of the Commercial Credit Co. of New Orleans since the organization of that unit.

Aero Officials to Confer

NEW YORK, Aug. 4—Uniform regulations governing the licensing and operation of aircraft within the borders of various states will be taken up at a conference of state aviation officials to be held in Cleveland at the time of the 1931 Air races, according

to announcement made by the Aero-nautical Chamber of Commerce of America, Inc. Tentative date for this conference is for the mornings of Sept. 1 and 2. The conference will also discuss means of developing landing fields in small communities.

The meeting has been called by Governor George White of Ohio and invitations will be extended to state directors of aeronautics, members of state aeronautic commissions, and the aviation committees of state legislatures.

White Adds Division

CLEVELAND, Aug. 3—Formation of a motor coach division, a new department, has been announced by George F. Russell, vice-president and sales manager of the White Co.

J. A. Kiggen, Jr., who for the past two years has been New York state manager for the White Co., has been promoted to sales manager of the coach division. He will have headquarters in Cleveland.

Cadillac Managers Meet

DETROIT, Aug. 3—Regional managers, branch managers and their sales managers and department heads of the Cadillac Motor Car Co., comprising a group of more than 50 men, convened at the Cadillac factory today.

The first session was devoted solely to business. J. C. Chick, general sales manager, conducted the meeting, and outlined a sales program for the balance of 1931.

Sets Class D Record

PHILADELPHIA, Aug. 3—A new international Class D speed record has been established at Tat, Hungary, by Hartmann, driving a Bugatti, according to an announcement from the Association Internationale des Automobile-Clubs Reconnus. The record, established May 14, covers the mile run (flying start) and was officially set at an average of 123.48 m.p.h.

Mack Profits in Second

NEW YORK, Aug. 4—Mack Trucks, Inc., reports net profit for the June quarter of the current year of \$127,411 after all charges. This is equivalent to 16 cents a share on common stock outstanding, and compares with earnings of \$1,409,924 or \$1.85 a share for the corresponding period of last year.

For the six months ended June 30, the company shows a loss of \$51,326. This compares with profit of \$1,900,633 or \$2.49 a share for the first half of 1930.

Ford Opens New California Plant

Richmond Branch Will Supply North and Central Part of State

SAN FRANCISCO, Aug. 3—The new \$5,000,000 assembly plant of the Ford Motor Co. at Richmond, Calif., which will supply Ford products to northern and central California, as well as the Hawaiian Islands, American Samoa, the Society Islands, Tahiti, and Guam, was scheduled to be formally opened today. The plant is another unit to be completed in the company's \$60,000,000 worldwide expansion program which was announced last year. It replaces the Ford branch in San Francisco.

The plant is located on the waterfront of San Francisco Bay, where both rail and water transportation is available. In this respect it is similar to most of the other new Ford branches which have been completed recently in many parts of the world. Parts manufactured at the main Ford plants in Dearborn, Mich., will be transported to the Richmond plant in Ford vessels via the Great Lakes and the New York State barge canal to branches on the Atlantic seaboard and sent through the Panama Canal.

The Richmond plant is the second large Ford waterfront factory to be completed on the Pacific Coast. The first, at Long Beach, near Los Angeles, Calif., was put in operation in 1930. A third, at Seattle, Wash., will be ready about Dec. 1. The largest such plant is at Edgewater, N. J., across the Hudson River from New York City.

I.H.C. Trucks Gain in N. Y.

NEW YORK, Aug. 4—Registrations of International Harvester Co. trucks in the metropolitan area during the first six months of the current year are 47 per cent over those of the same period for last year, according to E. Burke, manager of the New York City branch. This compares, according to Mr. Burke, with a 9 per cent loss in this territory for the industry as a whole.

Registrations of International trucks in this area have shown a steady advance from ninth place in 1928 to fourth place in 1931, according to the announcement.

Goodyear Reports Profit

NEW YORK, Aug. 4—Goodyear Tire and Rubber Co. reports net profit for the first half of the current year of \$4,221,770. This is equal, after preferred dividends, to \$1.06 a share on common stock and compares with earnings of \$5,592,309 or \$2.02 a share for the first half of last year the report states.

July Shipments

Graham-Paige Motors Corp. has reported July production of 1512 units against 1992 in June.

Hupp Motor Car Co. has reported production of 1257 cars during July as compared with 1631 during June.

Reo Motor Car Co. reports export shipments for the month of July more than double those for June, which was the previous high month for 1931.

Buick Motor Co. has reported production for July totaling 5320, compared with 6479 in June and approximately 15,600 in July last year.

Chevrolet production in July totaled 66,307 cars and trucks, according to an announcement by W. S. Knudsen, president and general manager. This represents a gain of 13 per cent over the 58,690 units built in July, 1930.

July is the third successive month in 1931 to show a gain over the corresponding month last year, and output for July brings the total for the first seven months of the year to 588,452 cars and trucks.

The company is continuing production into August at a seasonal rate, and with no summer shutdown planned, Mr. Knudsen said. Current employment is around 33,000 men, he stated.

Reo Motor Car Co. has reported production of 1812 units during July against 1739 in June.

Auburn Automobile Co. shipped 2580 Auburn and Cord cars in July, as compared with 3205 in June and 646 in July, 1930.

Shipments for the first seven months of the calendar year now total 30,240 cars, which is 16,549 more than for the entire year of 1930. In the twelve months of 1929, the peak year for the company and for the industry, Auburn shipped 22,567 cars.

Favors Probation for Operators

NEW YORK, Aug. 4—Feeling that operator's licenses should be given only to those who are fitted to operate on the highways without endangering the public, Robbins B. Stoeckel, commissioner of motor vehicles of the state of Connecticut, is attempting to put into effect a system of probation for the reinstatement of operators whose licenses have been revoked or suspended. This department is attempting to establish a state-wide probation system in which it will use its inspectors as probationary officers.

The object of this plan is to determine, in individual cases, whether the person who has had his license revoked or suspended is naturally unfit to operate a vehicle, and to exercise a restraining influence upon those who might be inclined to be reckless, but otherwise are fit operators.

If the plan is successful, Mr. Stoeckel contemplates the introduction of a bill in the 1933 state legislature covering the details of such a probationary system.

Financing Co. to Liquidate

NEW YORK, Aug. 4—Commercial Credit Co., Inc., of Louisiana, has voted to liquidate the company, sell all assets and distribute the proceeds to the stockholders. All business handled by this company will, in the future, be handled by the Commercial Credit Co. of Baltimore, of which the Louisiana company has been a subsidiary.

Materials' Prices Steady

NEW YORK, Aug. 4—Prices of raw materials used by the automotive industries were steady during July, according to the index of automotive raw materials' prices compiled by Ray B. Prescott for *Automotive Industries*. In the middle of the month the index stood at 94, the same figure registered in June. In the month of July, 1930, the index was placed at 104. Bradstreet's index of general raw material prices stood at 98 for the month of July just past.

Financial Notes

Borg-Warner Corp. and constituent companies report net profit for the June quarter of the current year of \$759,227, or 57 cents a share on common stock, as compared with \$1,277,560 or 98 cents a share for the corresponding quarter of last year.

Six months earnings were \$1,084,845, or 78 cents a share, and compare with \$2,375,326 or \$1.82 a share for the first half of last year.

Trico Products Corp. reports net profit for the first half of the current year of \$1,145,930 or \$3.05 a share, as compared with earnings of \$1,158,780 or \$3.08 a share for the corresponding period last year.

Earnings for the June quarter were \$631,668 or \$1.62 a share, as compared with \$584,106 or \$1.56 a share for the corresponding quarter of last year.

Murray Corp. reports for second quarter net profit of \$234,118 against loss of \$204,983 in first quarter and net profit of \$438,849 in second quarter last year. The net profit for first six months was \$29,135 against net profit first six months last year of \$734,043. President Avery said in a statement: "During second quarter we purchased balance of common stock of Dietrich, Inc., which gives us complete ownership."

Mohawk Rubber Co. earnings for the first half year showed substantial improvement over the first half of 1930. Profit for six months ending last month were \$72,197, after expenses, but before depreciation and interest. This compares with loss of \$151,783 for first six months of last year.

Ainsworth Mfg. Corp. reports consolidated net income for three months ended June 30 of \$42,514 after all charges, including taxes. This is equivalent to 26 cents a share on the \$10 par common and compares with net loss of \$35,233 in preceding period and net profit of \$189,771 or \$1.16 a share in second quarter last year.

General Motors Acceptance Corp. and subsidiaries, in a consolidated balance sheet as of June 30 shows undivided profits on hand at that time of \$9,845,296.

Mathis Plans No Front Wheel Drive

French Company Will Present New Straight Eight at Paris Salon

PARIS, July 25 (*by mail*)—No front-wheel drive car will be produced by the Mathis company, according to an announcement made by E. E. C. Mathis, president. At the Paris show the Mathis company will present a new straight eight of 2 $\frac{3}{4}$ by 3 15/16-in. bore and stroke, incorporating free wheeling and a double silent transmission. This car is made with wheelbases of 131 and 124 in. It has shown 90 m.p.h. on the road. Prices will range from \$2,000 to \$2,500. Numerous American units are incorporated in this chassis.

Mathis states that for June the number of units produced was 40 per cent higher than last year, thus making it possible to substantially increase the orders placed with American supply firms. A dividend of 25 per cent was paid out on last year's working.

Caterpillar Tractor Profit 77c

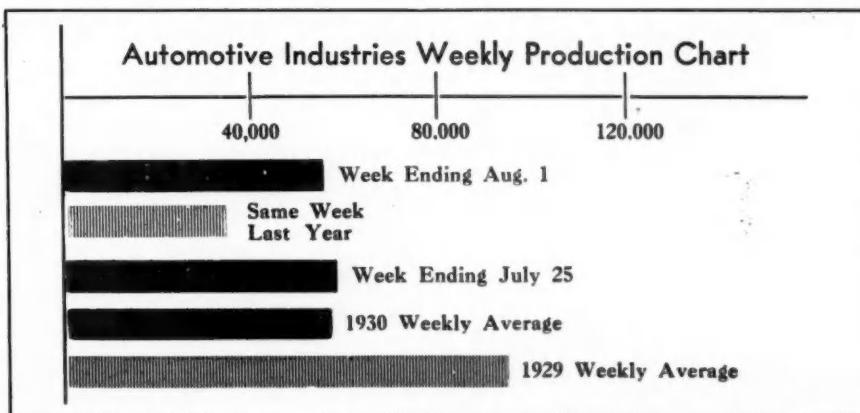
NEW YORK, Aug. 3—Caterpillar Tractor Co. reports net profit for the first half of the current year of \$1,446,476. This is equivalent to 77 cents a share and compares with earnings of \$5,622,965, or \$2.99, for the corresponding period a year ago.

Cadillac Shipments Increase

DETROIT, Aug. 3—During first 20 days of July Cadillac-LaSalle shipments showed 116 per cent increase over corresponding period last year. LaSalle accounted for 53 per cent and Cadillac V-8 for 25 per cent.

Tobin Succeeds Carroll

L. W. Tobin has been appointed superintendent of stores and planning of AC Spark Plug Co. to succeed Charles Carroll, who resigned as production manager in charge of planning department, effective August 1.



German Market Hit by Crisis

Ford Plant at Cologne is Reported Closed; Others Lag

It appears that the financial crisis in Germany and the conditions leading up to it have seriously affected the sale of automobiles of non-German manufacture in that country. The natural consequence of the depression was that what demand for automobiles remained was chiefly for cars of very low power, to the development of which German firms have devoted themselves with considerable success in recent years. The shift in the demand is clearly indicated by some figures published in *Automobiltechnische Zeitschrift* of July 20. Of the cars registered during the first five months of 1930, 70.8 per cent belonged to the class with up to 128 cu. in. piston displacement. During the first five months of the current year this figure increased to 75.2 per cent, and in May of this year it rose further, to 77.3 per cent.

Most of the cars imported into Germany are of larger displacement, and cars of this type are meeting with increased sales resistance because of the high annual tax based on displacement and on the high tax on fuel, which was increased only recently. According to the paper quoted, the four leading American cars on the German market, the Ford, Chevrolet, Plymouth and Essex, are being considered less and less as commercial vehicles by German purchasers, owing to their high tax rate and their high fuel consumption (as compared with the baby cars), and they are not well suited as "show" cars; according to the German taste.

Some of the more important importers, however, are represented also in the class of vehicles with up to 128 cu. in. displacement, including Ford, Fiat and Citroen, but the share of the importers in the total sales in this class has been decreasing. During May the registrations in the class up to 128 cu. in. displacement included 232 Ford cars, 137 Citroens, 110 Fiats and 119 vehicles of other foreign makes. Of the German makes Opel was represented by 2670 cars, Hanomag by 888, and all of the German makes together constituted 93.2 per cent.

It is pointed out that the position of Ford is greatly overestimated, owing to his (from the German viewpoint) unusual publicity. Ford sales in May of the two models (8 and 13 hp., amounted to 662 cars, valued at \$608,000. Ford sales were exceeded numerically by Adler, Hanomag and Opel, and on the value basis by Daimler-Benz, Adler, Wanderer and Opel. Ford's share in the sales of passenger cars in the German market has been declining continuously since the beginning of the year, having amounted to

May Gasoline Consumption in 45 States Rose Above April and Exceeded May of Last Year

NEW YORK, Aug. 3—Gasoline consumption in forty-five states and the District of Columbia for the month of May, 1931, as indicated by reports made by wholesalers and dealers in the various states under provisions of the gasoline tax laws or gasoline inspection laws, totaled 1,202,340,000 gallons, compared with 1,165,625,000 gallons in May, 1930, an increase of 36,715,000 gallons, or 3.1 per cent, according to the American Petroleum Institute.

Daily average consumption for May,

1931, was 38,785,000 gallons, compared with a daily average of 36,255,000 gallons in April, 1931, an increase in daily average during May of 7.0 per cent.

Gasoline consumption in these forty-five states and the District of Columbia for the five months ending with May, 1931, amounted to 4,990,303,000 gallons, compared with 4,838,117,000 gallons for the corresponding period of 1930, an increase of 152,186,000 gallons, or a total ratio of 3.1 per cent.

Gasoline Consumption by States, May, 1931

	Tax Per Gallon Gallon Cents	April, 1931 Gallons	Month of May, 1931 Gallons	May, 1930 Gallons	5 Months Ending With May, 1931 Gallons	May, 1930 Gallons
Alabama	4	13,949,000	14,626,000	15,083,000	65,630,000	70,821,000
Arizona	5	6,644,000	6,494,000	6,444,000	30,699,000	31,954,000
Arkansas	6	9,939,000	9,984,000	11,791,000	50,308,000	54,979,000
Colorado	4	15,124,000	15,707,000	14,620,000	66,790,000	63,739,000
Connecticut	2	15,700,000	18,991,000	19,786,000	75,757,000	80,539,000
Delaware	3	1,617,000	4,653,000	3,171,000	13,896,000	13,228,000
District of Columbia	2	7,881,000	8,236,000	7,162,000	35,646,000	30,577,000
Florida	6	20,101,000	19,054,000	18,183,000	104,915,000	104,536,000
Georgia	6	17,939,000	19,037,000	18,886,000	86,947,000	89,741,000
Idaho	5	4,908,000	5,577,000	5,524,000	20,221,000	20,293,000
Illinois	3	82,405,000	88,827,000	90,313,000	374,074,000	356,108,000
Indiana	4	42,176,000	43,379,000	*42,089,000	179,832,000	*172,366,000
Iowa	3	33,968,000	38,162,000	32,075,000	159,896,000	146,983,000
Kansas	3	29,930,000	36,626,000	30,080,000	143,371,000	141,082,000
Kentucky	5	14,202,000	15,408,000	15,163,000	65,131,000	62,076,000
Louisiana	5	15,613,000	15,909,000	15,358,000	72,534,000	74,404,000
Maine	4	7,662,000	11,145,000	10,144,000	31,905,000	28,570,000
Maryland	4	15,771,000	16,507,000	16,913,000	69,732,000	66,919,000
Massachusetts	3	47,986,000	50,235,000	47,926,000	197,911,000	189,603,000
Michigan	3	67,925,000	73,250,000	74,214,000	293,534,000	293,245,000
Minnesota	3	36,323,000	40,767,000	32,838,000	159,094,000	139,154,000
Mississippi	5	†11,159,000	†11,701,000	14,107,000	†52,503,000	55,726,000
Montana	5	8,276,000	7,407,000	10,000,000	29,573,000	23,596,000
Nebraska	4	17,284,000	19,751,000	17,814,000	88,371,000	87,484,000
Nevada	4	1,883,000	2,127,000	1,614,000	8,221,000	6,271,000
New Hampshire	4	4,558,000	6,062,000	5,712,000	19,676,000	19,218,000
New Jersey	3	46,531,000	50,518,000	49,590,000	209,823,000	198,350,000
New Mexico	5	4,341,000	4,512,000	4,458,000	29,666,000	20,161,000
New York	2	129,047,000	147,269,000	137,715,000	575,468,000	544,015,000
North Carolina	6	17,337,000	18,237,000	20,343,000	91,576,000	98,713,000
North Dakota	4	13,978,000	12,243,000	11,914,000	44,746,000	41,758,000
Ohio	4	82,462,000	90,615,000	94,577,000	272,365,000	376,345,000
Oklahoma	5	21,262,000	25,650,000	26,382,000	117,242,000	123,382,000
Oregon	4	15,042,000	18,224,000	15,542,000	67,148,000	61,016,000
Rhode Island	2	7,273,000	9,071,000	7,223,000	34,741,000	31,927,000
South Carolina	6	10,158,000	10,196,000	10,349,000	47,571,000	46,842,000
South Dakota	4	12,669,000	12,756,000	12,540,000	54,758,000	52,176,000
Tennessee	5	16,928,000	18,045,000	18,804,000	79,853,000	80,247,000
Texas	4	66,550,000	72,106,000	68,008,000	316,881,000	311,060,000
Utah	4	5,514,000	5,215,000	5,521,000	22,571,000	22,717,000
Vermont	4	3,247,000	4,517,000	4,287,000	13,831,000	12,967,000
Virginia	5	19,581,000	20,952,000	20,658,000	86,852,000	84,068,000
Washington	5	18,040,000	26,290,000	23,216,000	107,210,000	100,029,000
West Virginia	4	11,061,000	12,647,000	13,188,000	47,819,000	47,787,000
Wisconsin	4	32,778,000	40,234,000	41,164,000	160,757,000	149,293,000
Wyoming	4	3,040,000	3,421,000	3,136,000	13,253,000	11,952,000
Total		1,087,652,000	1,202,340,000	1,165,625,000	4,990,303,000	4,838,117,000
Daily Average		36,255,000	38,785,000	37,601,000	33,048,000	32,041,000
Increase over previous year:						
Amount of Increase			36,715,000		152,186,000	
Percentage Increase in Daily Average			3.1%		3.1%	
* Revised. † Estimated. ‡ Became 4c on May 12, 1931.						

11 per cent in January, 8.2 per cent in March, and 7.6 per cent in May.

Other American manufacturers suffered even more severely. During May only thirty Chryslers and De Sotos were sold in Germany. Five Oaklands, four Auburns, six Packards and one Lincoln were also registered.

According to a report in *Iron Age* of July 30 the new Ford plant at Cologne has been shut down as a result of the financial crisis in Germany.

Hudson Earnings 33c

DETROIT, Aug. 3—Hudson Motor Car Co. has reported net earnings for the first six months of \$526,992 or 33 cents per share, against \$3,392,012 or \$2.12 per share in the first half of 1930.

Net income for quarter ended June 30 was \$300,597 after depreciation, federal taxes, etc., equal to 19 cents per share on 596,660 shares outstanding.

Exports, Imports and Reimports of the Automotive Industry For June and Six Months Ended June, 1931-30

	Month of June				Six Months		Ended June	
	1931 Number	Value	1930 Number	Value	1931 Number	Value	1930 Number	Value
Automobiles, parts and accessories	\$12,775,311	.....	\$20,974,487	.....	\$93,895,869	.....	\$182,806,068	.....
*Electric trucks and passenger cars	4,340	2,539,768	5,336	3,816,737	29,170	15,740,948	55,050	36,506,786
**Under one ton	472	155,847	1,444	877,971	4,791	1,704,363	21,920	11,841,367
**One and up to 1½ tons	3,362	1,472,915	3,578	2,274,082	20,874	9,443,500	30,435	19,168,020
**Over 1½ tons to 2½ tons	305	563,331	314	664,684	2,328	2,695,503	2,695	5,497,399
Over 2½ tons	154	298,479	.....	.....	933	1,722,220	.....	.....
PASSENGER CARS								
Passenger cars except electric	5,843	3,757,994	10,077	7,315,948	54,838	33,685,390	106,884	74,293,002
Low price range, \$850 inclusive	4,637	2,419,609	7,311	3,812,928	43,345	20,806,434	78,094	39,724,663
**Medium price range, over \$850 to \$1,200	704	674,320	2,332	2,443,213	7,266	6,958,551	25,224	26,147,862
**\$1,200 to \$2,000	242	336,366	434	1,059,807	1,918	1,767,859	3,566	8,520,477
**Over \$2,000	99	267,013	.....	.....	1,025	2,615,613	.....	.....
PARTS, ETC.								
Parts, except engines and tires								
Automobile unit assemblies	3,540,477	.....	5,625,965	.....	25,715,906	.....	38,935,176	.....
Automobile parts for replacement (n.e.s.)	2,466,706	.....	3,404,145	.....	14,736,187	.....	24,476,517	.....
Automobile accessories	292,769	.....	462,731	.....	2,050,183	.....	3,400,781	.....
Automobile service appliances (n.e.s.)	647,969	.....	494,704	.....	2,263,829	.....	3,749,725	.....
Trailers	27	18,064	51	47,509	491	159,211	883	421,296
Airplanes, seaplanes and other aircraft	21	324,851	54	796,259	63	911,141	186	2,838,482
Parts of airplanes, except engines and tires	178,264	.....	201,495	.....	982,793	.....	1,141,454	.....
BICYCLES, ETC.								
Bicycles	188	4,879	637	15,935	962	24,955	2,279	60,709
Motorcycles	272	66,212	516	118,827	3,843	938,657	7,828	1,793,417
Parts and accessories, except tires				64,170	.....	330,324	.....	607,207
INTERNAL COMBUSTION ENGINES								
Stationary and Portable								
Diesel and Semi-Diesel	17	53,959	14	79,637	163	206,980	158	469,613
Other stationary and portable:								
Not over 10 hp	657	51,632	2,274	162,628	4,855	378,564	14,458	1,136,799
Over 10 hp	670	356,676	597	358,778	3,281	1,567,309	3,246	1,826,867
Automobile engines for:								
Motor trucks and buses	72	21,629	91	23,640	3,984	597,403	18,928	1,530,249
Passenger cars	1,406	112,639	2,696	232,870	12,888	1,079,845	33,043	3,024,702
Tractors	1	100	22	6,438	9	3,603	163	68,478
Aircraft	42	253,319	55	223,609	155	810,736	183	832,784
Accessories and parts (carburetors)				185,310	.....	267,687	.....	2,003,995
IMPORTS								
Automobile and chassis (dutiable)	68	44,056	58	49,916	317	383,235	268	430,899
Other vehicles and parts for them (dutiable)		3,778	.....	195,182	.....	29,218	.....	324,221
REIMPORTS								
Automobiles (free from duty)	11	5,867	31	27,310	85	73,627	143	122,801

* Not shown separately after 1930.
** Classification changes beginning January, 1931.

Willys First Quarter Sales Show Increase

TOLEDO, Aug. 3—Domestic business of the Willys-Overland Co., in the first three weeks of July, showed a gain over the same period last year, according to L. A. Miller, president.

Shipments from the factory showed a gain of 16.8 per cent, while unfilled orders on hand were 70.9 per cent more than at the same date last year.

Orders being placed by dealers for the new Willys-Knight 95 model for immediate delivery indicates that the field for the sleeve-valve-engined cars has been greatly broadened by this new model.

Sell Service Contract

PHILADELPHIA, Aug. 3—To induce new and used car buyers to come back regularly for service, some Chevrolet dealers now are offering \$5 and \$10 service agreements covering five lubrications and inspections, for which the buyer pays in advance.

The \$10 agreement includes five complete lubrications including change of motor oil, one change of rear axle and transmission lubricant, five inspections and a lubrometer, a key operated device for indicating the mile-

age at which the car should be brought in for these services. In addition the contract covers cleaning headlamp lenses, floor mats and glass in doors and windshields; also checking tire pressures and water in batteries and radiators. The \$5 agreement covers the same service except that it does not include the motor oil changes. At regular prices, it is stated that the service provided by the \$10 agreement would cost \$15.50 and by the \$5 agreement, \$8.

Customers buying this service plan are given a contract detailing the work that will be done and also a card which the service station punches as each lubrication and inspection is performed.

Perfection Offers Heavy Duty Hoist for Trucks

GALION, OHIO, Aug. 3—The Perfection Steel Body Co. is offering a new heavy-duty hydraulic hoist for Fords and Chevrolets with a complete line of steel bodies. The hoist, which is ruggedly constructed, has a "cushion drop" mechanism, or automatic control, which drops the body, full or empty, rapidly to the riding position without slamming the frame. The hoist raises the load to 50 deg.

"Mother of Pearl" Used in New Reo Royale Finish

LANSING, Aug. 3—A new style of finish for automobiles, in what is known as a perlescent shade, has been applied to a number of Reo Royale models that are being displayed at Reo salesrooms at Detroit and New York and at the factory in Lansing, Mich.

The pigment is mainly of ground "mother of pearl" carefully scaled from the inside of selected oyster shells. This lining of the shell when ground retains all the iridescent beauty of mother of pearl. The automobile body is first coated with a base coat of black lacquer on top of the usual under coats. Over the black lacquer is sprayed the newly developed pigment consisting of the ground shell mixed with a small amount of black pigment in clear lacquer.

The reflection and refraction of light resulting from the evenly distributed minute particles of mother of pearl produce an ever-changing beautiful effect said to be entirely unlike any other color effect. To afford contrast and emphasize the beauty of the complete car the new point effect is set off by black belt molding and stainless steel wheels.

Revision Planned On Brake Code

A.S.A. Approves Committee to Revise Tentative Recommendations

NEW YORK, Aug. 3—A committee to revise the present American Tentative Standard Safety Code for Brakes and Brake Testing has been approved by the American Standards Association. The project is sponsored by the American Automobile Association and the U. S. Bureau of Standards.

The present code covers only two-wheel braking systems for passenger cars and trucks, and the revision is intended to include all types of braking systems now in use on both passenger cars and trucks.

The committee will include representatives of the following organizations:

American Automobile Association, American Association of State Highway Officials, American Electric Railway Association, American Society of Civil Engineers, Asbestos Brake-Lining Association, Automotive Council of Los Angeles, Bendix-Cowdrey Brake Tester, Inc., Eastern Conference of Motor Vehicle Administrators, Enos Safety Foundation, Ford Motor Company, Highway Research Board, International Association of Police Chiefs, Iowa State College, Motor and Equipment Association, Motor Vehicle Conference Committee, National Association of Mutual Casualty Companies, National Association of Taxicab Owners, National Automobile Chamber of Commerce, National Automobile Dealers Association, National Bureau of Casualty & Surety Underwriters, National Electric Light Association, National Research Council, National Safety Council, National Highway Traffic Association, Society of Automotive Engineers, State of Oregon, State of Minnesota, Underwriters Laboratories, U. S. Bureau of Standards, U. S. Bureau of Public Roads, U. S. War Department, and Weaver Mfg. Co.

Aero Transport Gains

NEW YORK, Aug. 3—Air transport operations during the first half of 1931 covered 18,242,475 miles, a new record of six months' period, and compares with 12,224,321 miles during the corresponding period of 1930. Air mileage flown represents 92 per cent of the total mileage scheduled.

Air mail carried during the period totaled 4,523,432 lb., an increase of 13 per cent over the first half of 1930, and 31 per cent over the corresponding period of 1929.

Express shipments totaled 387,740 lb., nearly three times the amount handled during the first six months of 1930. Passenger traffic totaled 176,143 passengers.

August 8, 1931

++ CALENDAR ++ OF COMING EVENTS

SHOWS

International Garage Exposition, Berlin, Germany	May 9-Aug. 9
Olympia Passenger Car Show, London	Oct. 15-24
Olympia Truck Show, London	Nov. 5-14
Passenger Car Show, Glasgow	Nov. 13-21
Motorcycle Show, London	Nov. 30-Dec. 5

CONVENTIONS

S.A.E. Aeronautic Meeting (in conjunction with Natl. Air Races), Cleveland, Ohio	Sept. 1-3
Eastern States Exposition, Springfield, Mass.	Sept. 20-26
American Welding Society, Boston, Mass.	Sept. 21-25
American Electric Railway Assn., Atlantic City, N. J.	Sept. 26-Oct. 2
S.A.E. National Production Meeting, Detroit	Oct. 7-8
National Safety Council, Chicago, Ill.	Oct. 12-16
Society Industrial Engineers, Pittsburgh, Pa.	Oct. 14-16
Transportation Meeting, S.A.E., Washington, D. C.	Oct. 27-29
American Chemical Society, Buffalo, Aug. 31-Sept. 4	
American Society Mechanical Engineers (General Meeting), Kansas City	Sept. 7-9
W. Va. Motor Transportation Assn., Charleston	Sept. 11
Society for Elec. Development, New York City	Sept. 11
Steel Founders Society, Chicago	Sept. 17
American Institute Mining and Metallurgical Engineers—Iron and Steel Division, Boston	Sept. 21-24
American Society for Steel Treating (National Metal Exposition), Boston	Sept. 21-25
American Society Mechanical Engineers—Machine Shop Practice, Boston	Sept. 21-26
American Gear Mfg. Assn., Pittsburgh	Oct. 15-17
National Hardware Assn., Chicago, Oct. 19-22	
American Iron and Steel Institute, New York City	Oct. 23
American Railway Assn.—Motor Transport Division, Chicago	Oct. 27-28
American Society Mechanical Engineers—Annual meeting, New York City	Nov. 30-Dec. 4
American Roadbuilders Association, Detroit, Mich.	Jan. 11-14, 1932

Houpert-Ragot Co. Formed

NEW YORK, Aug. 3—Houpert-Ragot Engineering Co., Inc., has been organized with headquarters in New Rochelle, New York, for the handling and selling of French patents in the United States.

The membership of the firm consists of H. J. Houpert, who was for 20 years president and general manager of the Houpert Machine Co. of Long Island City, manufacturers of piston and automobile parts, and L. A. Ragot, who was sales manager of the Michelin Tire Co., Milltown, N. J., for 20 years.

Muller Develops Supercharged Car

Follows Lines of His Front-drive Product of Recent Manufacture

PHILADELPHIA, Aug. 5—W. J. Muller, who developed a front-drive car some year ago, has equipped one of these cars with a supercharger of the Roots blower type, thereby increasing its speed to 95 m.p.h.

The car is a roadster with an eight-cylinder engine of 3-in. bore by 4 1/4-in. stroke. The engine drives the front wheels through a worm gear with a reduction ratio of 3 2/7 to 1 and the transmission gear members are located partly in front and partly back of the worm of the driving gear, which permits of a wheelbase of only 114 in.

The supercharger is located at the rear of the engine and projects through the toe board, but is suitably covered. It is driven from the crank-shaft by two 3/4-in. V-belts at engine speed. The belt pulleys are 6 in. in diameter and the center distance is only slightly more than the pulley diameter, giving very short belts.

A 1 1/2-in. Zenith carburetor is used, and is mounted ahead of the supercharger, so that combustible mixture rather than air is passed through the blower. Control of the engine is by the carburetor throttle. The supercharger is in operation at all engine speeds and therefore helps not only to increase the maximum speed of the car but also to improve its acceleration. At part throttle the supercharger is of value particularly in improving the atomization and distribution of the fuel.

A fuel consumption of 13 miles to the gallon is obtained, which is not at all bad considering the size of the engine and the acceleration obtainable. On full throttle the pressure in the inlet manifold will rise as high as 4 lb. p. sq. in., whereas without the supercharger the manifold pressure naturally is somewhat below atmospheric.

The advantages of a supercharger as used on the Muller car are that it improves the acceleration and raises the maximum speed. The value of the supercharger is realized to the full in mountain driving. Owing to the great increase in engine power, a supercharged car usually can pass all others on an up grade.

The installation of the supercharger on the Muller car is very simple, and as the weight of the blower is only 40 lb., it adds little to the weight of the car. As the speed is no greater than that of the crankshaft, the high speeds associated with superchargers of the centrifugal type are obviated and the drive by belt is the simplest conceivable.

We understand that Mr. Muller is planning to make arrangements to manufacture this supercharged car.

Automotive Industries

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Milwaukee Knee-Type, Milling Machines

A COMPLETE new series of Knee-type Milwaukee milling machines is announced by Kearney & Trecker Corp., Milwaukee, Wis. Features include a greatly broadened range of spindle speeds from 15 to 1500 r.p.m.; feeds from $\frac{1}{4}$ in. to 60 in. per minute, a new center-bearing spindle with worm drive, a Sponson type knee, a stabilized column, and multiple V-belt drive with the motor set at right angles to the spindle.

Of particular interest is the newly invented dividing head in which the customary worm and worm wheel mechanism has been replaced by a precision hypoid spiral bevel gear and pinion. This new dividing head represents an advance in dividing head construction, permitting the cutting of short leads by power and accomplishing many other operations heretofore impossible.

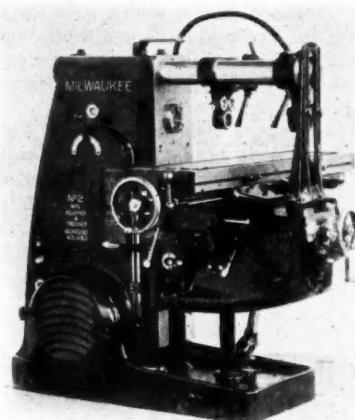
The new milling machines are available in two sizes, No. 1 and No. 2, each of which is offered as follows: The horizontal type in three models—universal, plain and manufacturing; and a sliding head vertical type in two models—plain and manufacturing.

In keeping with the modern trend of greater speed and rigidity for machine tools, these machines are well suited for use with tungsten and tantalum carbide milling cutters.

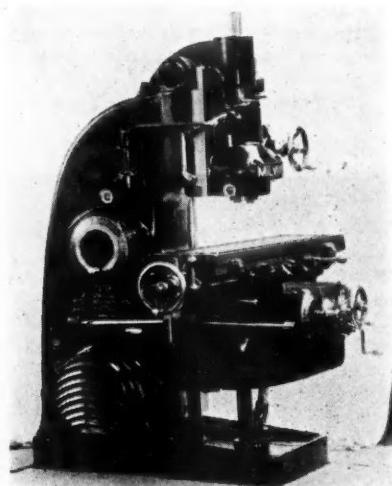
All models of the new Milwaukee are provided with rapid traverse in six directions. The rapid traverse multiple disk clutch runs in oil, and

is carried by a double wall plate at the front of the knee. This clutch can be adjusted without removing the plate from the knee.

An innovation in the design of the column is the fact that the motor is mounted at right angles to the spindle. This arrangement not only makes the motor accessible from both ends, but also greatly strengthens the column. Adjusting screws are provided so that the pivoted motor bracket can be adjusted one way or the other as a means of keeping the belts at proper tension.



A thread milling attachment can be furnished, which permits the milling of all threads from 38 per inch to 1 per inch, and in addition $1\frac{1}{2}$ threads per inch for pipe threading. Threads can be milled on a taper, such, for example, as pipe taps, studs and similar pieces, by elevating the tail center and setting the dividing head at the proper angle. With the new dividing head and this attachment, it is now possible to mill threads in a milling machine by power for the first time.



Federal Press 65-Ton No. 6

A RECENT announcement by the Federal Press Co., Elkhart, Ind., tells of the addition of a 65-ton model to their line. The No. 6 is built in both geared and flywheel types with an integral back gear bracket in geared machines. Timken roller bearings are used in the mounting of the back shaft on the geared presses.

With this mounting, there is no chance for misalignment on the back gear mechanism. The brackets are cast integral part, insuring accurate alignment, as they are bored at the same time the main bearings are.

The flywheel model weighs 9000 pounds; the back geared, 11,300 pounds. Both are equipped with a reclining bracket that operates from the front of the press and is removable, leaving the floor space clear for tote boxes. The Federal (patented) non-repeat tripping mechanism is also included as standard equipment.

Howell Motors

HOWELL ELECTRIC MOTORS CO., Howell, Mich., announces a new double-sealed, ball-bearing as standard on all Red Band motors. The bearing is packed with a congealed oil and completely sealed in a dust-proof room at the point of manufacture. This eliminates all possibility of dust, dirt or other injurious abrasives entering the interior of the bearing in the process of manufacture.

Brown & Sharpe V Blocks-and-Clamps

V BLOCKS - AND - CLAMPS No. 750B and V Block 750C have been added by the Brown & Sharpe Mfg. Co., Providence, R. I. Each block is of hardened steel $2\frac{1}{2}$ in. long, $2\frac{3}{4}$ in. wide and 2 in. high. Made and sold only in numbered pairs. Clamps are drop forged and clamp screws are hardened. V Block No. 750C leaves the entire top side of the work accessible. It is of hardened steel 3 in. long, $4\frac{1}{4}$ in. wide, 2 in. high, and is ground on its bottom. Has a capacity for round stock to $1\frac{1}{2}$ in. diameter. Clamps and screws are hardened.

V Blocks-and-Clamps No. 750B has stepped clamping lugs and is recommended for inspector's use; the blocks can be used on their sides as the clamps do not project. The stepped construction also allows changing the clamps quickly from small work to work up to 2 in. diameter. Blocks are ground in pairs and all sides are at right angles. The V grooves of any pair of blocks are accurately ground central and in alignment.

The clamps are designed to hold square, rectangular or round stock. A hole through the center allows drills, drifts, etc., to project through the work. A tongue in the bottom is a convenience when the block is used on a machine table where it can be clamped conveniently by the flanges. Wherever relatively light work is being done along the top side of stock, No. 750C is recommended.

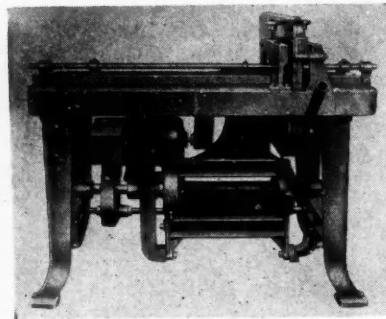
(Turn to page 224, please)

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Campbell Cut-Off Machine No. 30

AN abrasive disk cut-off machine for extra wide stock has been added by Andrew C. Campbell, Inc., Bridgeport, Conn. It will cut materials of certain characteristics up to 1 in. thick and 16 in. wide at the rate



of 2 to 12 seconds per cut. Nickel silver, soft iron, hardened high speed steel, and similar materials can be cut up to $\frac{3}{4}$ in. thick and 6 in. wide. If these materials are thinner, correspondingly wider cuts can be made.

The adaptability of the machine for cutting such wide stock is due to the arrangement for moving the disk through the material. The travel arm is so arranged that the spindle travels parallel to the top of the table without the use of slides. Dirt and grit cannot enter the moving parts to affect the movement of the disk. Other features of the machine are: The motor is started and stopped by a push button conveniently located. A straight edge is provided for locating the work so that the proper angle cut can be made. Quick-acting, adjustable clamps firmly hold the work to the table. Welded steel guards fully protect the operator.

Vickers Hydraulic Relief Valve

A"BALANCED" hydraulic relief valve for machine tools and other applications has been announced by Vickers, Inc., Detroit, Mich. Instead of the customary spring-loaded construction, it is operated by a piston that is in hydraulic balance regardless

of the initial oil pressure and the pressure for which the valve is set. Consequently, it is said to be more sensitive and accurate throughout the pressure range.

Another advantage of this valve is that it is installed directly in the line and in any position—this eliminates the customary tee and results in a neater and more compact installation. Longer life is assured by alloy steel working parts that are hardened and ground to close limits.

A hydrocone-shaped valve prevents wire drawing and eliminates oil foaming which aerates the oil. It is non-surgung and operation is quiet since the balanced piston makes chatter impossible. Control is very simple; turning the adjusting screw will vary the pressure from one extreme to the other.

The Vickers Hydraulic Relief Valve (balanced) is made in two sizes—for $\frac{3}{4}$ in. and $1\frac{1}{4}$ in. pipe connections. Their capacities are 0 to 15 gal. per min. and 10 to 40 gal. per min. respectively. The pressure range for both is from 0 to 2000 lb. p. sq. in.

10 ft. Cincinnati Lathe

HERE is one of the latest 20 in. x 10 ft. Cincinnati lathes with motor mounted inside of the leg fitted complete with hexagon turret on bed, power feed, square tool block in the compound rest and a four jaw independent chuck. Made by the Cincinnati Lathe & Tool Co., Cincinnati, Ohio. The hexagon bed turrets are made automatic revolving and with automatic independent feed stop for each face of the turret arranged either for hand or power feed. The power feed drive is from a pulley on the rear end of feed rod to another rod at the back of the bed. Power feed disengages automatically by a trip which stops within a reasonable degree of accuracy, but is supplemented by a positive stop enabling the operator to finish lengths accurately to 0.001 in. A lever on slide permits indexing of turret to any position without returning slide to extreme end of the stroke. With this

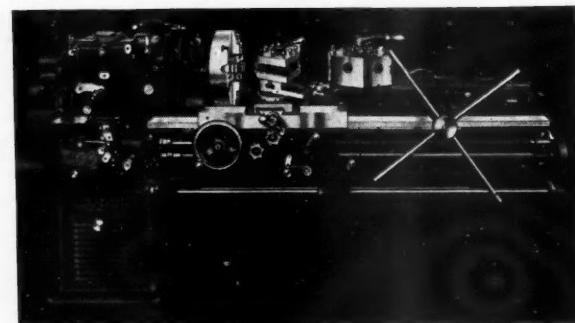
equipment production may be multiplied if in small or large lots by always having six tools ready for any combination suitable to machine their work always most economically. It is not necessary to transfer the work on to another machine to do the threading.

A recent set-up on this machine is boring a $1\frac{1}{8}$ in. hole in brackets, $4\frac{1}{2}$ in. long within .001 of accuracy. These brackets are held on a simple angle plate bolted on to a standard face plate to hold the correct center distance. This is a simple and inexpensive fixture, and any amount of similar ones can be placed on this same face plate. Boring is with a bar held in the hexagon turret and piloted into a bush in the spindle. Rough and finish boring is done in the same way. This work was taken off a drilling machine and is now done in $1/5$ of the time. Whenever various diameters are also to be turned the use of the four-way tool block shown in the compound rest enables many different operations to be done without stopping the lathe to change the tools. With it 12 patented positive indexing positions are obtainable, giving three positions for each tool. These attachments are supplied on the entire line.

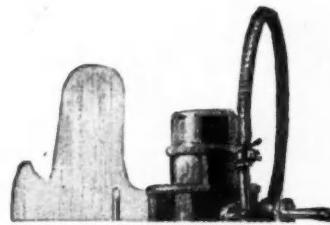
Johnson Bushings

JOHNSON BRONZE CO., New Castle, Pa., announces self-lubricating bushings of cast phosphor bronze and rolled sheet metal, both of these having graphite-impregnated bearing surfaces. In each case from 40 to 45 per cent of the total bearing surface is graphite-impregnated. Dovetail grooves, $\frac{1}{2}$ in. wide, are cut in the bore of the cast phosphor bronze bushings, longitudinally at an angle of 7 deg. to an element of the cylindrical surface. In the case of the rolled sheet-metal bushings, grooves are cut into strip metal, and by forming the metal into cylindrical shape the grooves automatically form a dovetail which holds the lubricating mixture in place permanently. An advantage is claimed for forming the grooves by cutting rather than by pressing, as the metal structure is not injured by cutting.

(Turn to page 226, please)



The Short Cut to Quieting Gear Operation:-



FELLOWS SERVICE

which enabled one manufacturer to start producing a new gear set with 95% OK-ed assemblies right from the start.

The development of free-wheeling, helical gear, and other modern types of automobile transmissions has brought production managers considerable grief.

In talking recently to one of these prominent men who has just completed two new jobs, he made the following statement: "When we decided to adopt these two new jobs, we profited by past experience. As we have done in previous cases, we submitted our designs to your engineers for advice and suggestions. Both jobs went through our production department with flying colors, and in a much shorter time than we expected. In fact we never got into production before with as little grief."

It is interesting to note that this plant uses complete Fellows Equipment from finished blanks to final inspection. Every operation is under complete control. Why not submit your new designs to our engineers and profit by their experience. At least ask to have one of our Sales Engineers call and explain this service to you.

THE FELLOWS GEAR SHAPER COMPANY, Springfield, Vermont, U.S.A. (or Detroit Office, 616 Fisher Building).



FELLOWS
~ GEAR SHAPERS ~

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Udyblack is New Cadmium Coloring

UDYLITE PROCESS CO., Detroit, Mich., licensor of the Udylite process of cadmium plating, announces a new finish, Udyblack. This finish is particularly adaptable to articles of ornamental iron and to cast and sandblast surfaces.

It will produce either a jet black or a steel gray against a high-lighted bright Udylite, depending on the method of relieving. The coating consists of a black powder which can easily be wiped off. Underneath the powder there is a thin steel gray coating which adheres very well to the Udylite coating. As the coating does not accelerate the corrosion of Udylite, the combination coating possesses at least the rust-proof qualities of Udylite.

James Vertical Spiral Bevel Gear Speed Reducer

A NEW vertical spiral bevel speed reducer has been added by the D. O. James Manufacturing Co., Chicago, Ill. Gears are of chrome nickel of spiral bevel type to secure

greater efficiency from the improved tooth form which is said to provide more teeth in contact and a greater tooth bearing or pressure area in each tooth of given size. Where large ratios of reduction are required this type of reducer is made integral with a planetary reduction unit so that all ratios from 8 to 1 to 1600 to 1 are available. They are made in sizes from $\frac{1}{2}$ to 100 hp.

Hanna Riveters Fabricate Wheels

TWO single purpose riveters have been developed by the Hanna Engineering Works, Chicago, Ill., for fabricating wheels of agricultural implements. The riveter shown in Fig. 1 is used first for attaching spokes to rim. Two $\frac{3}{8}$ -in. cold rivets are driven simultaneously with 50 tons on the duplex dies. Before each stroke cycle of the rivet dies the riveter jaw must enter between two spokes and drop behind the rim flange. To accomplish this the wheel rotates and moves to and from the riveter and the riveter jaw moves up and down. A roller nest truck provides the wheel movement and a pneumatic jack swings the riveter on trunnions to provide the

vertical movement of jaw. Nest rollers and wheels of truck are ball-bearing mounted. Jack is controlled by a poppet valve conveniently located. The riveter dies are controlled by a heel-operated valve which may be located on the floor at the most convenient position.

The riveter shown in Fig. 2 then is used to attach spokes to the hub. Before each stroke cycle of rivet dies the riveter jaw must enter selectively into one of the inclosures bounded by the rim, two spokes and the hub of the wheel. The wheel must then be moved toward the riveter so the jaw hooks in behind or above the hub flange. All these movements are provided for in a carriage in which the wheel lies flat. The wheel rotates in the carriage so the inclosures or openings are brought into index with the riveter jaw. It is moved up and down by means of an air jack mounted in the carriage. The carriage moves horizontally on four wheels mounted in a stationary stand and is actuated through a bell crank handle. The jack-actuated vertical movement also serves to nest the manufactured head of the rivets into the jaw die and to clamp the spoke firmly against the hub before the rivets are driven. The rivets are struck conveniently from above far in advance of riveting and thus act as aligning elements. The wheel rim is forced into a ring which makes it round, central with hub, and normal with hub axis. This assures finished wheel will run true, which is imperative.

Fig. 1 at the left is a Hanna riveter attaching spokes to rim, while Fig. 2 is attaching them to the hub + + + +

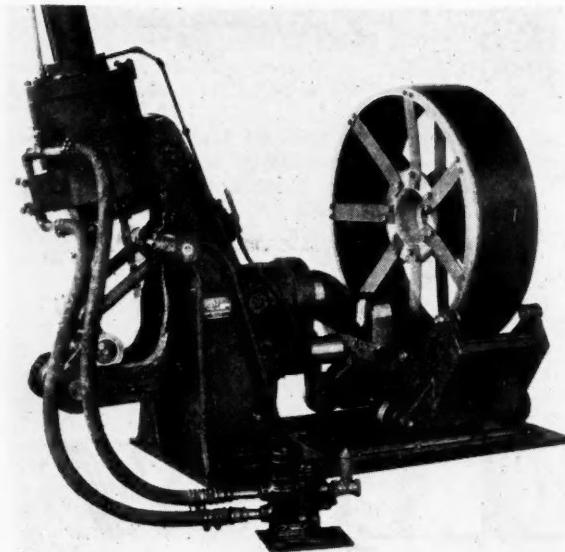


Fig. 1

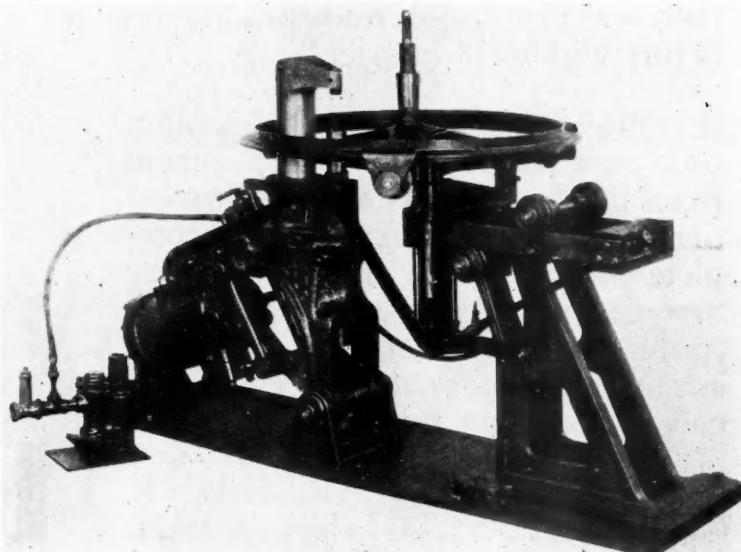


Fig. 2



STAINLESS AND HEAT RESISTING STEELS

USS Chromium-Nickel Alloy Steels are produced under licenses of the Chemical Foundation, Inc., New York, and Fried. Krupp A. G. of Germany

CHROMIUM NICKEL STEELS
Austenitic

USS 18-8

A Corrosion Resistant Steel for the Widest Range of Applications

USS 18-12

A Corrosion Resistant Steel for the Widest Range of Applications

USS 25-12

An Outstanding Development in Heat Resistant Alloys

ONE
OF
THESE
WILL
MEET
YOUR
NEED

CHROMIUM ALLOY STEELS
Ferritic

USS 12&12Z

Corrosion Resistant Steels for Machined Parts, forgings, and Special Applications

USS 17

A Corrosion Resistant Steel for General Requirements

USS 27

A Corrosion Resistant and Heat Resistant Steel Used Primarily for Highest Temperature Service

Bars - Plates - Shapes - Special Sections - Semi-Finished Products

CARNEGIE STEEL COMPANY Illinois Steel Company
SUBSIDIARIES OF UNITED STATES STEEL CORPORATION

PITTSBURGH, PA.



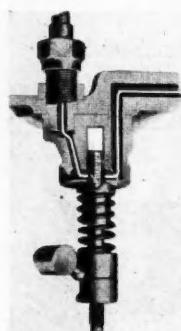
Chicago, Ill.

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Nathan Mechanical Lubricators

M ECHANICAL lubricators tried in service on thousands of locomotives have been adapted for industrial applications and are offered to the industry by the Nathan Manufacturing Co., New York, N. Y. These units are recommended by the maker for all types of machine tools and other equipment. In these lubricators only one piston



is used for each feed, actuated by drive that reciprocates and simultaneously oscillates the piston. It pumps oil and at the same time opens and closes suction and discharge ports. No valves are used. Positive delivery of measured quantities of oil is assured

wherever lubrication is needed, it can be fed against any pressure from zero to 500 pounds per sq. in.—higher when required.

Briefly summarizing the characteristics of the five different types: Type DS1 is equipped with sight feeds and visible piston indicators which show the travel of each piston in addition to the amount of oil passed through the sight feed glass. This type lubricator can be furnished with from 1 to 19 feeds and with capacities from 3 pints to 16 pints.

The Type D is similar in construction to the Type DS1 but the sight feed glasses have been omitted. This lubricator can be furnished with from 1 to 29 feeds and with capacities of from 3 pints to 14 pints.

The Type P comprises a pumping mechanism only, which can be attached to existing reservoirs by means of a pipe connected to the side of the mechanism, while the Type PS, identical in construction, has its connection to an oil reservoir at the bottom to enable the mechanism to be mounted directly over an oil reservoir, the oil being drawn in through a tube extending into the reservoir. These lubricators are furnished with from 1 to 11 feeds.

In the Type PK the mechanism of the Type PS pump is equipped with an oil reservoir, making a very compact lubricating unit. This lubricator can be furnished with from 1 to 11 feeds and with capacities from 3 pints to 4 pints.

All of the lubricators can be furnished with ratchet drive or with a shaft suitable for a rotary drive.

Clark Lifting Type Truck

A LIFTING type power truck with four-wheel steer and rear-wheel drive, on which the steering wheels can be turned to a sharp angle enabling the operator to enter a freight car and spot his load at the far end has been placed on the market by the Clark Tructractor Co., Battle Creek, Mich.

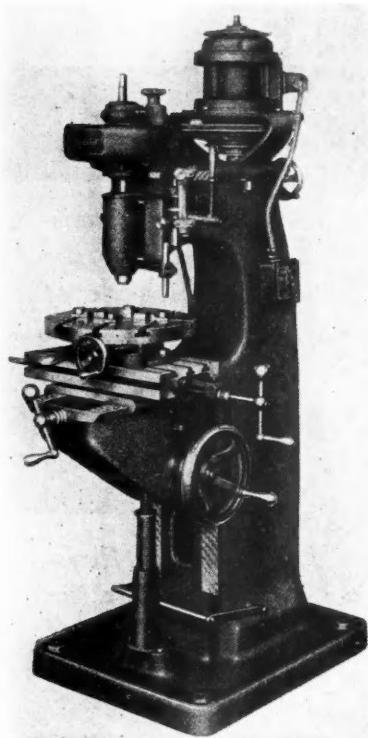
A locomotive type cast steel frame, full floating rear axle, hydraulic lifting mechanism with automatic control, and a tractor type gas engine with engine speed governed to less than 1400 r.p.m. are features that are claimed to insure long life and uninterrupted service. Acceleration under load is distinctive feature. One model has a narrow platform to accommodate U. S. Standard 12-in. under-clearance skid platform. It lifts a 3-ton load in nine seconds and its turning radius of 94 in. makes it easy to turn the corner of two intersecting 64-in. aisles with ample clearance all around. This model with its pointed platform is especially designed for loading box cars.

A heavier model lifts 4 tons in 8 seconds, has a speed of from 1 to 6 miles per hour and turns on a 94 in. radius.



No. 2V Reed-Prentice Router and Vertical Milling Machine

A NEW Router and Vertical Milling Machine for brass, steel and cast iron has been placed on the market by Reed-Prentice Corp., Worcester, Mass. This is a new design of the No. 2 size which has been popular with stamp, stencil and light die manufacturers. The motor is applied with an endless molded V-belt drive, being adjustable for proper belt



This latest of the Reed-Prentice router is proving popular with light die manufacturers ++

tension. The spindle pulley bracket and lock permit quick stop of spindle and ready change of collets and cutters. The sliding head is operated by either clutch handle or foot treadle and is provided with micrometer depth stop graduated in thousandths of an inch with a vertical scale graduated to 2 in. and sub-divided in tenths.

The motor is of 1 hp. capacity, 900, 1200, or 1800 r.p.m., providing a range of ten spindle speeds. Working surface is 18 x 8 1/2 in. Net weight is 1650 lb.

The Clark Tructractor shown here "on the job" is being offered in a range of sizes + +